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MANUAL FOR THE TRAINING OF SMALL-SCALE ENTREPRENEURS FOR THE DEVELOPMENT OF AN INDIGENOUS CONSTRUCTION SECTOR

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I. INTRODUCTION

1. The programme of work and priorities of the Economic Commission for Africa is directed towards strengthening the indigenous construction sector through improved transfer of appropriate technology, the development of indigenous skills and towards establishing commercial small-scale production units of selected local building materials which will have direct beneficial impact on housing rural population and the urban poor. If these poorer sections of the community are to be helped to build structurally durable and functionally adequate houses, the focus of attention should be on the provisions of suitable building materials to them at a cost they will be able to bear. The materials should be such as are available locally and that do not require much specialized skill in their use. The only real alternative to the extension of production of such building materials is the development of an appropriate technologies. In its turn the confirmation of the profitability of these technologies is a strong incentive to attract small-scale entrepreneurs 1/into the production of local building materials. The avenues should be provided for pilot production, full scale demonstration, marketing and training entrepreneurs for the widespread production of alternative building materials.

2. One of the most significant constraints to the development of the indigenous construction sector is the continuing lack of appropriate educational and training opportunities at the entrepreneurial and technicians levels. The training of small-scale entrepreneurs for the development of an indigenous construction sector in African countries needs considerable upgrading and lacks practical training programmes.

3. Training entrepreneurs for business creation in the field of local building materials is undertaking for a variety of purposes. Most often business creation is development of rural and less developed areas, better potential for employment generation, improving performance of small-scale construction industries by enlarging the supply of well-trained entrepreneurs. Less often stated in many programmes are the social and political goals implying matters of national identity and self-esteem, breaking down social and cultural barriers that discriminate against certain categories of people. The primary objective of this manual is to assist those involved in deciding and implementing programmes for training small-scale entrepreneurs for business creation and

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1/The individual who perceives needs in indigenous building materials, conceives building materials to satisfy the needs, organises the factors of production, and creates and markets the products is claled "an entrepreneur", the role he performs is called "the entrepreneurship".

improved performance in terms of time, quality and cost of production of indigenous building materials in African countries. Typically such people hold positions in the management assistance or training departments of development banks and industrial development organizations, but they may also be found in management training centres, technical institutes, government agencies and in such non-governmental groups concerned with economic and social development as co-operatives, small business associations.

4. This manual identifies the elements common to successful programmes and focuses on the process of small-scale business formation(feasibility analysis, business planning, project implementation) and on the issues of management and organisation necessary to operate the venture once it is started.

5. The manual has three parts: The first one concerns the different topics of pre-investment study that can be applied to small-scale building materials plant as a whole and considers elementary economic principles underlying the choice of technology, and other issues relevant to decision making in the project selection process. The second part covers the implementation issues such as promotional activities, project and engineering designs, construction and plant commissioning. The third part is on operational activities comprising business planning, financial control, labour management, legal aspects marketing, etc. This manual aims at raising the general level of training programmes for small-scale entrepreneurs so that they may better understand the environment in which they work, the social, economic and technical forces to which their plants are subjected at, the contribution they may make to the progress of their business. The manual is practical in approach, it aims to put the various entrepreneurial activities into a framework with a view to lay down a basis for such training programmes which could be functional, comprehensive, forward looking and flexible.

6. The manual is not addressed to problems related to motivation and behaviourial skills of entrepreneurs because this subject would require too much space for appropriate coverage.

II. FEASIBILITY ANALYSIS

7. Business (venture) creation describes the process from the conception of business idea to the beginning of commercial operations. In the case of small-scale business formation it is usually visualised as including:

The feasibility analysis phase - testing the workableness and commercial worth of the idea.

The activity initiation phase - resource acquisition (including finance) and implementation of operations.

The activities carried out within this process are the essence of small-scale entrepreneurship.

8. In smaller towns and non-urban areas, potential entrepreneurs do not possess building materials production experience, and therefore project selection options are limited. Opportunities based on local raw materials or markets and skills are often insufficient. The problem, therefore, is of identifying building materials: a) for which there is a reliable local or nearby urban market, b) which are basically of the "footloose" type and are therefore, c) suitable to the technical and economic conditions of the non-industrial less urban area in terms of levels of technology, skill, investment size and infrastructure. In general, small-scale entrepreneurs should identify production opportunities in their areas by study of:

the geography of the area;
the type of entrepreneurship prevailing in the area;
the availability of raw materials;
infrastructural facilities available in the area;
existing building materials industries;
the credit plan of the major concerned bank;
local building materials plans developed for that particular area.

9. Essentially a feasibility analysis aims to determine rather sketchy the answers to the following questions: Is there a market for the proposed building material, how large is it and how much can the proposed business reasonably be expected to obtain?
Can the proposed building material be locally manufactured? Is manufacture technically possible, will it work, will it be of acceptable quality and is it legal? What scale of operations will be necessary? What assets will be required? How many people will be needed? What are the financial requirements of the small-scale business, how will these be obtained, and at what cost and repayment terms? What are the expected financial returns from operation of the proposed small-scale production of local building materials?

Systematic approached of varying degrees of sophistication are used to determine if the proposed business is both workable and financially worthwhile.

10. Before undertaking project, the small-scale entrepreneur should investigate a number of factors prior to investing in a building materials production unit. These factors to be investigated are briefly reviewed below.

A. The market for local building materials

11. A market for the local building material first be ascertained. The mere knowledge that more building materials than available are needed at the present time constitutes an insufficient justification for embarking upon a new venture. Sustained demand is a prerequisite for profitable operation of the plant.

1) Factors influencing demand

1.1) The pattern of construction output

12. Because different facilities use different building materials, and in different proportions, the composition of construction output will be a factor in the demand for local building materials. Table 1 shows the patterns of material inputs into construction projects in Kenya, desagregated by the type of construction.

1.2) Technological change

13. The pattern of usage of building materials depicted in the above Table will prevail only as long as the technologies of construction and of building materials production remain stable. For example, the introduction of pre-fabricated housing construction would lead to the excessive consumption of cement per square meter than housing built by conventional methods. Changes in the technology of building materials production could affect patterns of consumption and demand through pricing and product substitution. As dynamic technolgies bring new building materials within the purchasing ability of low-income consumers, the demand for the products they replace will fall. For example, the introduction of concrete and gypsum blocks could slow the rate of growth in the demand for bricks.

1.3) Availability and prices of materials

14. Availability and prices of building materials are subject to multiple determinants. The first is demand from sectors other than construction. While building materials such as cement are consumed exclusively by the construction sector, other materials are not. A FAO study of wood use in the developing countries in the 1970s found that construction accounted for roughly 60 per cent of all sawn timber and 50 per cent of all wood-based panels used; nearly half of this amount went into housing. The second most common use of wood was for packaging, while the furniture industry consumed the third largest share of sawnwood and wood-based panels of any sector. An increase in the demand for non-construction products such as furniture would raise the prices and reduce the availability of sawnwood respectively.

Table 1. Materials inputs as a percentage of total expenditure for three types of construction projects in Kenya

Type of input	Residential buildings	Non-residential buildings	Civil engineering
Sand	4.60	6.40	2.98
Aggregate	5.60	5.20	9.94
Cement	10.00	13.40	2.98
Hydrated lime	-	-	2.39
Concrete products	6.00	3.80	2.78
Hardcore filling	1.50	0.90	
Wood products (timber,doors,etc)	8.90	3.00	- 0.40
Steel products	3.00	17.90	22.88
Hardware and windows	4.50	2.90	2.98a/
Paints	8.20	2.20	
Glass	1.00	1.30	-
Floor tiles	5.20	1.65	-
Roofing materials	4.10	2.30	-
Plumbing and sanitary fixtures	7.80	5.00	-
Electric installations	5.20	2.05	- -
Explosives	-	-	2.98
Fuels,bitumen and lubricants	-	-	2.40
Total materials	75.60	68.00	52.71

Source : United Nations Centre for Human Settlements, Nairobi, Kenya, Role and contribution of the construction industry to socio-economic growth of developing countries, Cambridge, Massachusetts: CMT Inc., November 1980 (revised April 1982),IV-44

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a/ Includes paints

15. A second determinant of prices and supplies of building materials relates to world production and consumption trends of these commodities, especially materials with uses other than construction. Commodity gluts and scarcities will affect the world prices for these raw materials and processed goods, which will be reflected in the price structure within developing countries. Where alternative materials are available, upward or downward pressures on prices will affect the demand for the interchangeable material inputs, even as the demand for the final construction product remains constant.

16. Finally, in some cases, governments regulate the prices of certain building matrials. In Egypt, the government controls not only the price, but also the supply and distribution of cement. The influence of public policies on consumption of building materials is treated below.

1.4) Trends in product substitution

17. To assess the relationship between construction and the demand for bulding materials, it is necessary to take into account the possibility of substituting other inputs for materials whose prices have risen or whose supplies have been curtailed. A wide range of substitutions even among conventional building materials is possible for residential buildings. Newly processing methods for indigenous materials add to the possibilities. For example, gypsum wallboards may be substituted for bricks in interior walls in countries where gypsum is widely available. Finding alternatives for conventional materials for roofing, exterior and interior walls and floors is basic to any strategy for constructing more low-cost housing in African countries in the coming years.

1.5) Government policies and regulations

18. Public policies in many areas affect the demand for building materials. Mentioned above were the regulation of price, supply and distribution. Related to this are importing and exporting policies. Incentives to export certain building materials (or their raw materials) will result in increased prices and reduced consumption of these items domestically, while tariffs on import will raise the domestic price of the protected building material. The role of the government as a purchaser should also be considered. Major defense or public engineering works may completely alter the nature of demand for building materials by requiring heavy imports or severely retarding other construction works by creating shortages of materials.

19. To increase the demand for indigenous building materials the government policy emphsis should be in favour of developing a coherent and comprehensive strategy to strengthen domestic construction capacity. And policy measures for the small-scale secter or informal sector need to be addressed to both small and large enterprises within the framework of a coherent national industrial strategy. A strategy for developing and strengthening domestic construction capacity would in most cases involve:

the generation of increased local employment and maximising local employment at construction sites;

the development of skilled technicians and enhancing the role of national professional staff in the design, planning and management of new projects;

the reduction in the cost of new construction by expanding the production of appropriate locally manufactured building materials and reducing the import content of new construction;
and

increasing the share of domestic construction work undertaken by national contractors through contractor development policy measures.

1.6) Forecasting demand for building materials

The direct and indirect influences on the demand for building materials reviewed above should serve as a basis upon which to project demand for these materials.

Future demand for local building materials should be investigated by examining housing development proposals, government five-year plans, etc., and by obtaining information from the Ministry of Housing and other government regional or local authorities.

2) Market-base

20. The size of the market is the most important factor in determining not only the size of the plant, but more importantly, the appropriate production technology. In most African countries the size of the market is very small, mainly due to low consumption rates and lack of transportation facilities and the high cost involved in transferring building material to other consumption centres.

21. Initially the problem becomes one of assessing and determining the size of the markets for which the production of apropriate building materials should be started. Generally, the market base for any building material is directly related to the capacity of consumers to pay for it and inversely related to its cost. What is apparent for many building materials is that per capita consumption seems to be directly related to GDP or alternatively to per capita national income. In other words, the consumption of building materials varies almost linearly with per capita income. It is, therefore, possible to predict the level of actual demand per capita income and the delivered cost per unit all known. Information per capita national income is available for most African countries, while per capita consumption for some building materials is difficult to get. Furthermore, projections of materials consumption based on the country's past consumption trends should also be taken into acount. Plans for construction of large civil engineering projects, housing estates, etc., may indicate immediate and considerable increases in size of the market for some building materials plants. If there is a government building programme of long duration, this alone or in conjunction with normal consumption patterns might serve as a useful indicator of the size of the market.

B. Consideration of the most important production criteria

1) Raw materials

22. The availability of raw materials, of suitable quality and quantity is a basic factor in making decisions on the establishment of building material production plants, regardless of the scale of production. The size of raw - material deposits is an important consideration in the choice of the scale of production. Small-scale plants can use smaller deposits, for example, limestone and clay, for the production of lime and burnt bricks. Before making decisions on the appropriate size of the plant and the production technology, information and data are required about deposits of the various indigenous raw materials. As a rule such information is available at various departments of mines, geological survey organizations, research institutes and material testing laboratories, etc., and also from the reports of special geological studies undertaken under consultancy and technical assistance contracts. At the local level preliminary information on raw materials can be obtained from an examination of materials used in traditional construction, as well information from local residents about sites, where some building materials were produced in the past. The above information should be analysed to determine its scope in terms of type of raw materials, geographical distribution, quantities, quality, current use and accessibility. This

analysis will help in determining the extent and scope of additional studies which would have to be undertaken to support production activities. For example a series of preliminary and detailed surveys of deposites must be made in order to determine the extraction operation such as workable area, the average thickness of overburden, the average thickness of deposites and their yield, the total overburden and deposites, and the position of the water table.

23. The facilities and capabilities of geological survey departments, building research institutes and testing laboratories should be used to support programmes for the investigation of raw materials. In Ghana, for example, such institutional support ensured mapping and tests of minor limestone deposits. Fig. 1. and Table 2. give a summary of the result in the determination of the location of limestone deposits and their general quality.

24. Accessibility of raw materials must be considered from two perspectives: the physical access in terms of a road link and the ease of exploitation with respect to land owner-ship rights and payment of royalities.

25. The significance of small-scale plants is enhanced by their ability to use a multitude of industrial and agricultural wastes in the production of building materials. For instance, in the production of cement and lime, small-scale technologies, such as the vertical shaft kiln can operate on press mud waste from the sugar industry, lime sludge from the paper industry or acetelyne sludge. These industrial wastes are interchangeable in the same kiln and lead to a reasonable standard product. An agricultural residue, such as rice husk which in many countries poses a problem of disposal, is a viable raw material for cementitious products. Very often, rice husk is available in small quantitities in dispersed farming communities, and this makes it a raw material suitable for small-scale production.

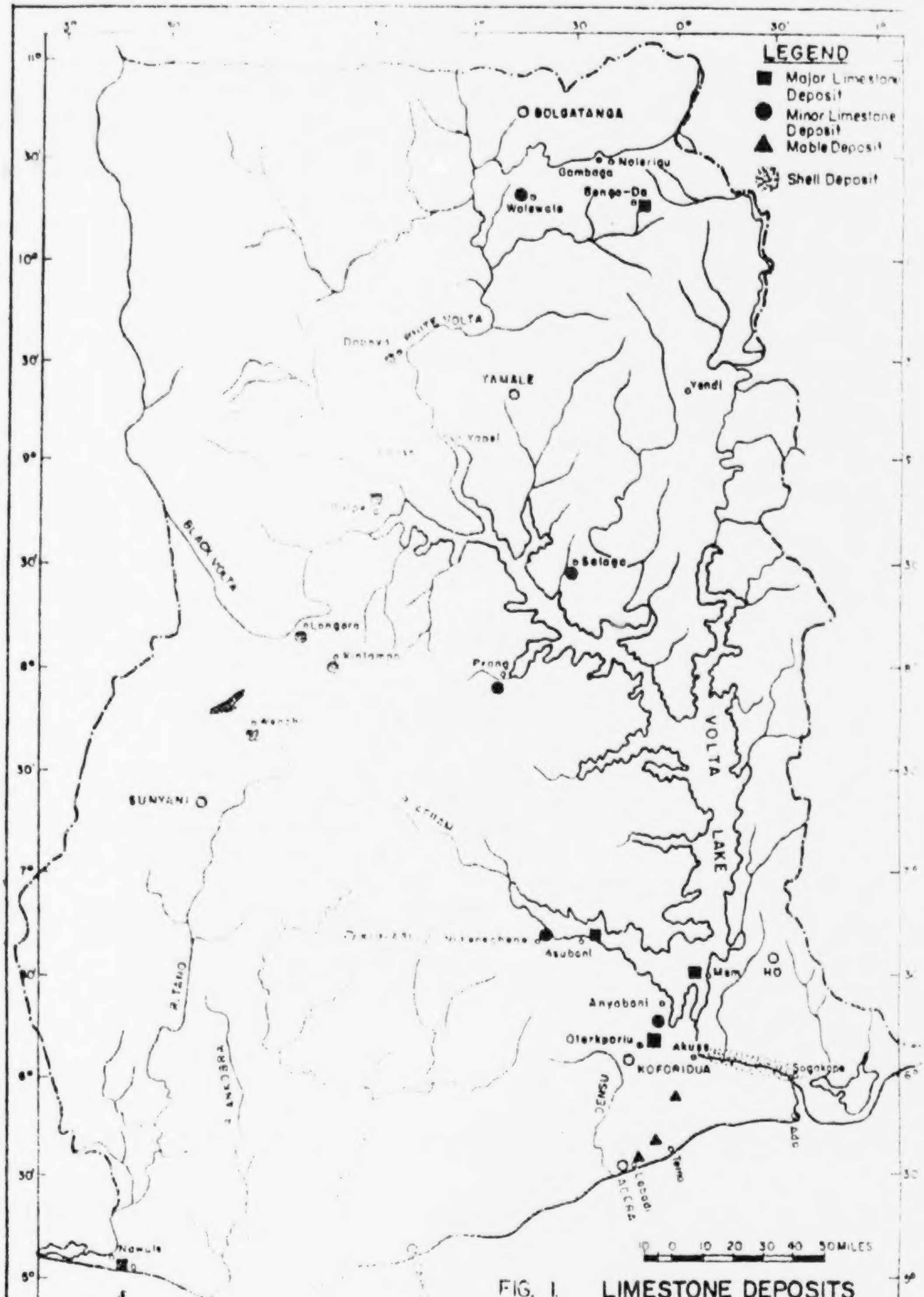

LEGEND
■ Major Limestone Deposit
● Minor Limestone Deposit
▲ Mable Deposit
Shell Deposit
BOLGATANGA
Nalerigu
Gambaga
Bongo-Da
Walewale
WHITE VOLTA
Daboya
YAMALE
Yendi
Yapei
Buipe
BLACK VOLTA
Salaga
Longoro
Kintampo
Prang
Wenchi
VOLTA
LAKE
SUNYANI
AFRAM
R. TANO
R. ANKOBRA
Nkwanchene
Asuboni
Mem
HO
Anyaboni
Oterkporlu
Akuse
KOFORIDUA
Sogakope
DENSU
Ada
Tema
Labadi
ACCRA
Nauli
10 0 10 20 30 40 50 MILES
11°
30'
10°
9°
8°
7°
6°
5°
3°
2°
1°
0°

FIG. 1. LIMESTONE DEPOSITS OF GHANA

TABLE 2. GENERAL QUALITY OF THE MINOR LIMESTONE DEPOSITS

Deposit	SiO_2%	CaO%	MgO%	Fe_2O_3 + Al_2O_3 %	Remarks
Longoro/ Kintampo	14.79	33.11	9,89	5.70	Siliceous magnesian limestone; suitable for hydraulic magnesian lime.
Daboya	19.70	25.19	13.17	1.55	Siliceous magnesian limestone;suitable forhydraulic magnesian lime
Walewale	22.27	27.51	11.59	2.40	Siliceous magnesian limestone;suitable for hydraulic lime.
Salaga	19.74	36.97	2.11	7.24	Siliceous low magnesian limestone; suitable for hydraulic lime.
Anyaboni	10.89	45.15	3.23	1.02	Semi-siliceous low magnesian limestone; suitable for hydraulic lime.
Prang	6.66	49.28	1.26	2.32	Semi-Siliceous low magnesian limestone; suitable for semi-hydraulic lime.

2) Energy

26. A complete evaluation of the energy used in the manufacture of a building material includes the energy used in raw matrial collection, transport, as well as the process itself, and should include, too, the energy used by the energy industry (for instance, in transporting oil or in converting coal to electricity). Because of the great variety of different processes used it is impossible to give a single figure for the energy requirement in any particular material. In general, though not always, it will be found that the more modern the factory for producing a particular material, the lower will be the energy required. Table 3. shows the range of energy inputs for a number of common building materials based on the work of several authors cited in Building Materials in Developing Countries by R.J.S. Spence and D.J. Cook, John Wiley & Sons, Chichester, New York, Toronto, Brisbane, Singapore.

Table 3. Energy requirement for different building materials (including transport to site)

	Material	Energy requirement (MJ/kg)
High energy	Aluminium	100-250
	Steel	30-50
	Glass	12-25
	Cement-rotary kilns(U.K.)	7-8
	shaft kilns	5-7
Medium energy	Lime	3-5
	Bricks-clamp	3.5-6.5
	trench-(India)	2-3
	Hoffman-(UK)	1.8-3
	Concrete-Precast	1-8
	Blocks	0.8-3.5
	in situ	0.8-1.6
Low energy	Timber	0.5-6
	Sand, aggregate	0-0.3
	Fly ash, RHA,volcanic ash	0-0.3
	Soil	0-0.1

Energy requirement for low energy materials is chiefly in transportation.

27. Three different classes of materials can be distinguished. The most energy-intensive building materials (expressed as the energy

used per unit weight of material) are aluminium, steel, glass and cement, in that order; bricks, lime, concrete and concrete products are medium high energy users; and soil, sand and aggregate are low energy materials. There is significant difference in the grade of energy used: the high energy will; depend on high-grade fuels (Electricity, oil, pulverized coal) in their manufacturing processes, which often carry a large import content; the medium high energy using materials, particularly bricks, tiles and lime, can often use low-grade local fuels such as firewood, poor quality coal, bunker residue, or crop waste, and even some solar energy for drying processes, fuels which are more easily available and may even be abundant. There are, however, many areas in which timber is rapidly becoming a scare commodity having once been plentiful. In such areas, the relatively inefficient traditional manufacturing industries (brick-and lime-burning, for example) cannot be allowed to continue, and alternative fuels and more efficient processes must rapidly be found to replace them. The low-energy materials use energy only in transportation and perhaps in crushing processes, but depend heavily on human energy.

28. To summarize energy saving issues in building materials it is possible mention the following:

1. Using more energy efficient manufacturing techniques.
2. Switching from more to less energy intensive materials and techniques.
3. Using less materials.

29. The selection of appropriate technologies should consider two approaches. The first is the selection of technologies which make use of available local energy resources. This will have several advantages: it will reduce the flow of foreign exchange; savings can be made in transportation costs for transferring fuel from other regions of the country, or abroad; substantial reduction in manufacturing cost; and also stimulating local economic activities. Secondly, the selection may be based on energy efficiency. Some technologies require more energy than others, and the approapriate technology by this criterion should be the one which consumes less energy. In general, capital intensive technologies are based on processes that require more energy; the less capital intensive, the less would be the consumption of energy. There is a direct relationship between capital-intensive and high energy consuming technologies and the volume of production, i.e., the larger the product capacity, the higher would be the energy consumption; conversely, the lower the output the lower would be the consumption. In summary, the criterion of energy consumption should

be evaluated with capital costs, labour requirements, transportation facilities, etc. The adequacy of transportation facilities is particularly important to ensure continuous energy supplies, if it has to delivered from other parts of the country or abroad.

30. In general, small-scale plants are capable of operating on inexpensive forms of energy, such as firewood. Even for cement production, it is possible to operate some small-scale vertical shaft kilns on solid fuels with a high ash content. Firewood is the predominant fuel in the small-scale sector in Ghana and the United Republic of Tanzania. Small-scale plants in Ghana also supplement firewood with sawdust briquettes and palm kernel shells. An important development in fuel use is the establishment of woodlots by some brick producers in Ghana and the United Republic of Tanzania to meet their fuel requirements. This is significant in the light of current public concern over environmental degradation caused by uncontrolled tree-felling operations. Fuel on which small-scale plants can operate include a multitude of residual products, most of which are renewable and occur as waste products. For instance, small-scale kilns producing lime and clay bricks can be fired with rice husk, and there are examples of kilns being fired on coffee husk as well as on residual oils. Agricultural wastes such as husks, chaff and straw have a high calorific value when properly used, can produce excellent fuels for many types of brick kilns.

31. The level of energy use in the producton of building materials varies with the type of material, the scale of production, the content of technology adopted and the type and relative cost of available energy sources. Table 4. shows the different sources of energy and their relative costs with respect to total production cost for selected building matrials in some African countries and in India.

Table 4. Energy consumption in the production of selected building materials

Material	Scale	Type of fuel	Fuel consumption (ton/ton)	Electric energy (kwh/ton	Energy cost percentage production
Brick (Egypt)	Small	Furnace oil	27.0	22.0	12.9
Brick (Ghana)	Small	Firewood	1.0		41.0
Brick (India)	Small	Coal	200.0		49.2
Lime (India)	Small	Coal	0.4-0.66		28.55
Concrete block (Egypt)	Small	Diesel oil a/		2.86-3.10 b/	1.0
Concrete block (Ghana)	Small				0.1
Concrete block (Mauritius)	Small			0.028	1.1

a/ For operating fork-lifts
b/ Consumption in kilograms per 1000 bricks.

Source: United Nations Centre for Human Settlements, Nairobi, Kenya, The economic and technical viability of various scales of building materials production, HS/180/89E,ISBN 92-1-131103-9,p.11.

3) Transportation

32. The need for adequate transportation facilities becomes important in the selection of appropriate technologies when recognizing the bulkiness and heaviness of most building matreials and the associated costs of transortation of raw materials and finished products. Thus, transport costs of both raw materials and finished products play an important part in determining the prices of building materials; high transportation cost could raise the prices of building materials to prohibitive levels for the great

majority of the population; this will in turn narrow the market base.

33. The effect of transport costs is significant in Africa, where the distances separating building materials plants and some of their markets are large. The two cement plants in Kenya are located in Mombasa and near Nairobi; for areas other than these cities, an estimated average excess amount of U.S.$15 per ton (in 1983) was added to cement to allow for distribution cost, with an extreme for the most remote districts of over U.S.$85 per ton. Land-locked countries pay even more for cement. In these circumstances local production even at a high price can reduce costs to the consumer.

4) Environment

34. The building materials industries contribute to the deterioration of the environment into two principal ways. The first is concerned with the extraction of raw matrials. Among the significant effects on the environment are soil devastation and aesthetical disfiguration of the natural environment, rising out of operations by heavy duty machine. Secondly, the concentration of building materials industries in urban areas pollutes the air.

5) Manpower requirements

35. Sufficient skilled and unskilled labour should be available within a short distance of the small-scale building materials plant, especially since its technology requires frequent attention through day and night. Labour requirements depend upon the type of material used, the degree of mechanisation, the productivity of labour and the quantity and quality of produced building materials.When planning manpower requirements due consideration should be given to the following factors: a) the main provisions of labour legislation covering industrial relations, procedures of recruitment and discharge; as well as wage levels; the number of shifts; and b) the number of annual working days.

36. When estimating manpower requirements, a distinction should be made between the preproduction and the operational phases. The persons required at the preproduction phase should be kept to a minimum to maintain its costs as low as possible. When estimating manpower requirements for operational phase, the functions and skill levels needed should be determined by the entrepreneur and aggregated for the project. The example of breakdown of labour requirements for a small-scale hydrated lime manufacturing plant in Ghana is illustrated in Table 5.

C. Location and site

37. A feasibility analysis has to define the location and site suitable for a project. There are many possibilities of locating small-scale plants for the production of indigenous building materials, depending on such relevant considerations as proximity to the market centres, availability of public utilities, transportation links and their costs, etc. One theory suggests that these plants should be located near the sources of raw material in order to decrease transportation costs of raw materials. Furthermore, this arrangements will help reduce imbalances between rural and urban areas as well as offering better income distribution. However, locating plants near the resources of raw material deposits may be more expensive due to infrastructural needs which have to be provided. These include roads, housing for the workers, schools, health facilities, power and water supplies, etc. Another location theory favours town and cities where not only the required infrastructure facilities may be easily available, but because of its proximity to the market centres. This, it is urged, will lead to the concentration of economic activities in towns and cities, increasing national polarization and income disparities between the urban and rural regions of the country. It will also add to the environmental problems existing in some cities of African countries.

38. The solution as to where small-scale building materials plants should be located depends on the availability of transportation facilities, their costs, the quality and quantity of the deposits, labour costs, power and water supplies, other infrastructural needs, etc. Factors such as preferential tax treatment and local taxes which governments offer within a regional development programme could also affect the location. In short, determining the location may amount to no more than systematic consideration of all possible locations, calculating transportation and production costs, costs of exploration raw materials, labour requirements and costs, energy and fuel supplies and their costs are particularly significant due to the energy-intensity of building materials production and choosing the lowest. Government planning policies may also influence the location of building materials industries, not only through taxes but also through long-range and large-scale construction programmes that may be planned for regions far from existing consumption centres. In this case, government low-interest loans may also be used to locate small-scale plants for the production of local building materials in areas where profitable operation could not otherwise be assured.

Table 5. BREAKDOWN OF LABOUR REQUIREMENTS FOR A SMALL-SCALE HYDRATED LIME MANUFACTURING PLANT

OPERATION	LABOUR	TYPE	DUTY	REMARKS
Quarry- 1 shift	1 Tractor Operator 1 Foreman 6 Labourers	Skilled Skilled Unskilled	Stripping of over-burden Drilling, blasting, rock breaking ing and loading	(To be hired)
Kiln- 3 Shifts	1 Foreman 5 Labourers	Skilled Unskilled	Firing and loading	For each shift
Processing- 1 Shift	1 Foreman 5 Labourers	Skilled Unskilled	Slaking, sieving and bagging	
TOTAL:	Skilled	6		
	Unskilled 26			

39. Efficient common production facilities may be an important instrument for concentration of technologically affiliated small industries geographically. The common production facilities may make it possible to introduce specialized technological skills that are economically justified on a collective but not on an individual basis. Initial investment and operation risks are often borne to some extent by public funds available to the small industry extension organisation. The location of the plant should be such that undue nuisance is not caused by noise, smoke, smell, pollution

of air or water as regulations may be in force regarding the protection of the environment.

40. An approach to the location of building materials production capacities was considered in UNIDO's monograph No.3 for Athens symposium on Industrial Development (1967). UNIDO suggested the definition of production criteria and classification of building materials graded according to selected production criteria (see Annex I. and Annex II). Annex I shows the definition of each criterion and of the three grades into which building materials may be placed with reference to it. The criteria as regards input are raw materials source, fuel costs, water and electricity requirements. These criteria together with criterion of cost of delivery directly affect the location of production units. Annex II shows 41 building materials graded by selected criteria. The first four columns and the last one present information which could be used in decision making in the location of production units.

41. Once the geographical area is decided upon, the specific site for the project should be defined in the feasibility analysis. This will need an evaluation of the characteristics of each site, as follows:

1) Price/Availability

42. In choosing a parcel of land for a project, entrepreneurs must weigh several factors. Since ideal sites are found only rarely, a final decision normally involves trade of among various factors. The availability of land is a basic concern for entrepreneurs. It entails more than a mere abundance of vacant or under-utilized land. The land must be physically amenable to development and the owner must be willing to relinquish all or part of his control. A related aspect of availability involves acquisition time and cost considerations. Depending on the complexities encountered, the length and expense of the real estate transaction process can vary greatly. This naturally affects a sites desirability.

2) Physical characteristics

43. Physical characteristics are important to entrepreneurs for several reasons. The topographic, hydrologic and soil features of a site can substantially affect the techniques and materials required for construction of the plant. These in turn will directly influence the cost of a project, possibly making it uneconomic. In addition, certain natural conditions such as wetland and underground water supplies can carry with them legal issues which can have profound effects on development feasibility.

3) Easements, rights of way, covenants

44. In addition to physical and locational characteristics, entrepreneurs must pay careful attention to property rights. The law has traditionally viewed property as a bundle of rights which may be held by one party or individual, or divided among several different parties. Thus, a landowner's property rights may be encumbered by interests in the same land belonging to others. These subsidiary property interests are reserved through legal devices such as easements, rights of way and covenants. They are important given the limitations which they can place on the design or use of a parcel.

4) Infrastructural facilities

45. Infrastructural facilities involving the provision of roads, water, electricity and other utility services are another significant site selection factor. Close proximity to these services is a critical development consideration, as is the availability of sufficient infrastructure capacity to meet increased needs. In studying the raw material deposits that have great potential for supporting small-scale building materials plants, therefore, an appraisal should be undertaken of the extent to which prospective project sites are served by basic infrastructural facilities, of plans and programmes for supplying the sites with infrastructure, and the additional requirements for infrastructural facilities, which may be incorporated into the design of projects for the production of local building materials.

46. The entrepreneur should liaise closely with Government ministries, departments and offices that are concerned with the provision of utilities and other infrastructure. Knowledge of the future programmes of these agencies would help in scheduling the programme for the implementation of building materials project. Agreements could also be reached on the incorporation of the infrastructural needs of building materials projects in special development schemes such as integrated rural development programmes.

D.Project Engineering

47. The scope of the project should not only cover the plant site but all other activities required to supply inputs, deliver outputs and provide ancillary infrastructure investments. This comprehensive approach should help to determine which investments have to be undertaken by the entrepreneur. Functional and physical layouts serve as a basis for defining the scope of the project and the subsequent engineering work. Once the entire extension

of the project is understood, the appropriate technological processes to be employed, the type and extent of machinery and equipment required, and the cost of technology and equipment involved should be determined on the basis of the identified plant capacity.

1) Choice of production technology

48. The feasibility analysis should define the technology required for a particular project, evaluate technological alternatives and select the most appropriate technology in terms of optimum combination of project components. To select an appropriate technology for a particular situation entrepreneurs should know the principal characteristics of intermediate technologies; that they are cheap to establish, small in scale, so as to be suitable for small, mainly rural communities; that they use relatively simple production methods, and produce building materials from local raw materials for local use. In many of their characteristics as defined above, intermediate technologies are similar to traditional technologies; but they are distinguished from them by making much more efficient use of labour and raw materials (for a small amount of additional investment) and by producing building materials of acceptable and controlled quality. They are technically more efficient, making use of modern scientific knowledge in such matters as properties of materials, combustion, heat transfer and so on; and they are organizationally more efficient, in such areas as production planning and control, labour management and financial control.

49. With relatively cheap labour available in most African countries, the labour-intensity aspect is important, both in terms of overall employment objectives and the direct cost implications of capital substitution at the enterprise level. The interrelationship between factor prices of labour and capital and the implication of substantial changes in one or other should be reflected in the choice of production techniques and in the degree of the mechanization at various levels of production operations. However, this aspect should not be considered in isolation as selection should be based on the combination of various factor resources in the project. In certain cases, the raw materials could determine the technology to be used. The quality of limestone, for example, is a determinant factor whether the wet or dry process is used for a cement plant. A technological process based on indigenous raw materials and inputs may be preferable to one for which the principal inputs have to be imported

indefinitely, particularly if serious foreign exchange regulations affect the inflow of such materials.

50. The choice of technology for a given building material would depend on the level of production envisaged, and whether it is for a commercial venture or for self-help community projects. The following factors should be considered in decisions on appropriate production technologies:

- What technologies, traditional or intermediate, are available already in the country and what are their relative merits from the point of view of production of reasonably cheap building materials?

- If the technology is new, for example, as in the case of rice husk ash cement, has sufficient research and development work been carried out locally to determine its viability?

- Has the technology been developed to the extent that a complete technical and business package is available particularly for use by entrepreneurs? If not, are there local institutions which could undertake the necessary developments towards this end?

- If the technology requires the use of equipment and tools, can these be fabricated locally, and if so can the fabrication capacity sustain increased demands resulting from successful popularization schemes; or will there be need to take simultaneous measures to strengthen existing capacities?

- Will the adoption of the technology entail continuing dependence on imported equipment and spares as well as some raw material inputs?

- Can the technology, for example, if it is intermediate, be easily mastered by local technicians and operatives?

- What will be the attitudes of local labour towards labour-intensive aspects of the production process? For example, will manual mixing of clay by trampling be acceptable?

- Are there adequately developed technical back-up services to support the preparation of the technology?

- Will the technology really lead to the production of reasonably low-cost materials to meet the objectives of low-cost housing?

51. The evaluation of technological alternatives should be related to plant capacity and should commence with quantitative assessment of product quality and marketability. Then the influence of the alternatives on capital investment and production costs should be assessed over a period. Apart, however, from the above basic criteria, the technology must have been fully proven and be utilized in the manufacturing process, preferably in the company from which it came.

2) Scale of Production

52. The scale of production determines the size of plant. With respect to appropriate technologies, the scale of production is sometimes associated with small-scale, household, cottage, etc., industries. In different countries, and even in different contexts within a country, different criteria such as employment, invested capital, value of output, capital output ratio, extent of power used, the structure of management, etc., have been used with arbitrary dividing lines in respect of each criterion for demarcating the various size groups. Thus, different definitions and criteria may be used by different groups of people dealing with particular aspects of their work. With regards to the choice of appropriate building materials industries, the scale of production has direct implications to all of these combinations of factors, i.e. management, employment, technology, market sizes, capital requirements, etc. In some cases the difference may be quantitative, in others it may be quantitative as well as qualitation, as in the case of traditional methods of production and industrial production methods. Like the concept of appropriate technologies, scale of production is a dynamic concept which has to be considered within the prevailing economic, social and technical conditions of the country. To some extent the nature of the market and the target groups dictate the scale of operations that can be contemplated. The scale of operations in turn has ramifications for the intensity of entrepreneurial characteristics, range and depth of management techniques and skills, sophistication of the feasibility analysis and business plan, depth of technical knowledge and skill.

3) Size of Plants

53. The selection of an appropriate plant size is one of the key elements in the decision to set up new building materials industries. It is essentially related to economies of scale. The main elements to be taken into account in the selection of appropriate size of plant are the cost of production and the capital cost; the price of competitive imports; the size of the prospective market and its anticipated growth; the distribution costs of the locally manufactured product, which depends on the geographical configuration of the country and other physical and economic characteristics of the domestic market; these factors in turn involve the problem of location and the availabilities of power, fuel and other supplies. If the size selected is too small, not only will the cost of production be higher than necessary, but it will not be possible after a time to satisfy the entire demand. If, on the other hand, too large a size is selected, the plant will operate over large part of its lifetime at less than full capacity and at uneconomical cost, largely because full charges for depreciation and maintenance of equipment and interest on capital will continue to be made against costs even though the actual output is below capacity. The minimum capacity plant will be the one at which local production costs equal the import price.

54. In the selection of appropriate plant size, there is also a need to consider the technological process. In some cases, alternative processes are available at least for certain operations so that it is possible to select a combination of techniques that will prove to be the most economical under given conditions. It may, however, be difficult to combine all the requirements needed for the selection of appropriate plant size. For one, with some capital-intensive building materials industries such as cement, steel, etc., there is a threshold capacity below which it is uneconomically to manufacture, and production must start using the available minimum plant capacity. Bricks and tiles are more flexible; they can be produced in variable quantities depending on the size of the market and according to qualities required. In general, building materials industries, particularly cement, lime and steel are becoming increasingly concentrated and the average size of new plants are significantly larger. Their capital costs are very high and an intensive continuous operation is required.

4) Selection of Equipment

55. The selection of equipment and technology are interdependent. In certain projects, such as a cement plant, production and operational technology is part and parcel of the supply of

equipment and no separate arrangements for technology acquisition are necessary. However, in cases when technology has to be independently acquired, the selection of equipment should follow the determination of technology as the two are closely linked. The requirements of machinery and equipment should be identified in the feasibility stage on the basis of plant capacity and the selected production technology. Equipment selection at the feasibility analysis stage should broadly define the optimum group of machinery and equipment necessary for a specific production capacity by using a specific production technique. This selection differs in emphasis with the type of project. An example of general equipment selection for a small-scale hydrated lime plan in Ghana is given in Table 6.

E. Financial and economic evaluation

56. Once all the elements of a feasibility analysis are considered, the next step is to compute the financial and economic viability of the project on the basis of the total investment and production costs. In many cases it has to be assumed that project financing is available at the time of feasibility analysis; the financial implications are then calculated and included in the total production costs. To facilitate the evaluation, both investment and production costs have to be defined clearly, keeping in mind that the profitability of a project will ultimately depend on the size and structure of investment and production costs and their timing. There is no set, exact formula for computing the investment and production costs. Various ways to estimate these figures can be considered, given the cost data of the production components.

1) Total investment costs

57. Investment costs are defined as the sum of fixed capital (fixed investments plus pre-production capital costs) and net working capital, with fixed capital constituting the resources required for constructing and equipping an investment project, and working capital corresponding to the resources needed to operate the project totally or partially. The terms 'fixed capital' and 'fixed assets' mean that money invested in land, buildings, plant, vehicles and equipment which the entrepreneur needs in order to be able to carry out his activities in starting up his venture will be out of circulation for at least a year. Pre-production capital costs include a number of items that originated during the various stages of project formulation and implementation. Net working capital indicates the financial means required to operate the project according to its production programme.

Table 6 : General Equipment required for a small-scale hydrated lime plant

OPERATION		EQUIPMENT	USE	REMARKS
Quarrying	1.	Tractor and Scraper	Removal of over-burden	(To be hired)
	2.	Air compressed drill	Drilling of blast holes	
	3.	Sledge Hammers	Breaking of lime-stone	
Loading	4.	Shovels, wheel-barrows, headpans, etc.	Loading lime stone into kiln	
Firing	5.	Steel wedges, cutlasses and axes	Cutting and splitting firewood	
Unloading and Professing Lime	6.	Shovels, wheel-barrows, headpans, etc.	Unloading of lime from kiln	Same as item 4
	7.	Sieves	Sieving lime	
	8.	Water tank	To hold water for hydration	

2) Total production costs

58. Total production costs incorporate plant costs, administrative costs, sales/distribution costs, financial costs and depreciation. 2/ The first three groups of costs together are the operating costs. Plant costs include the following: materials (variable costs), manpower (in general, variable costs), plant overheads (in general, fixed costs). The composition of administrative costs includes the following typical items : wages and salaries, office supplies, utilities, communications, engineering costs (contractual), rents, insurances (property), taxes (property). Sales/distribution costs incorporate costs for training of salesmen, advertising, travel expenses, packaging, freight, commissions. Financial costs (interests on total investment costs) are defined as a certain number of per cent per annum from the sum of fixed capital and working capital.

It is convenient to calculate depreciation by listing assets with columns for cost and depreciation as illustrated below :

DEPRECIATION

ASSET	Initial Value (1)	Life in Years (2)	Write off Each Year (3)
Land and Buildings	2000	50	40
Office Equipment	200	10	20
Plant and Equipment	800	8	100
Motor Vehicles	1200	6	200
Plant Reserves	800	-	-

2/ The term used for the reduction in the original cost of fixed assets to take account of wear and tear is depreciation. It is obvious that different assets will depreciate at different rates. No assets, apart from land, can last for ever. But some, like buildings, may last for 25 to 100 years, so they will lose their original cost value only very slowly. Other items like vehicles and equipment can be expected to wear out much more quickly. The entrepreneur is going to continue to trade well in future if his plant, equipment and other assets are kept up to date. Depreciation allows this to happen by ensuring that a proportion of the original cost of each asset is written off each year. This money can be placed in some kind of reserve fund to ensure that when, for example, a concrete mixer reaches the end of its useful life there is money available to buy a new one.

The depreciation on each item is given in Column 3 by dividing Column 1 by Column 2.

There is another method of calculating depreciation based on discount factor (F), which is given in the methodological framework for the estimation of unit production costs.

3) Unit costs

59. At the feasibility stage an attempt should be made to calculate unit costs. For a single-product project, unit costs are calculated simply by dividing total costs by the number of units to be produced at full capacity. It must be emphasized that the unit cost of indigenous building materials production will vary a great deal from country to country and even from one area to another within the same country. Unit production costs will vary according to local circumstances, including the following:

- availability of raw materials; whether they are available on site or has to be transported to the site;
- current prices for commodities, especially stabilising agents;
- whether the product is to be made in rural or urban areas; size and type of equipment used; quality required; and
- current wage rates, and productivity of the labour force.

To assist entrepreneurs envisaging to engage in small-scale building materials production UNIDO and ILO provided a methodological framework for the estimation of unit production costs. Staff of financial institutions, businessmen and government officials may have their own evaluation methodologies, but could still find that methodological framework useful, especially if they are unfamiliar with small-scale building materials production.

A methodological framework of UNIDO and ILO for the estimation of production costs is described below. The calculations in this framework are to be used as examples only and should be adapted to the particular circumstances prevailing in a given location, using the appropriate wages, input costs, etc.

METHODOLOGICAL FRAMEWORK FOR THE ESTIMATION OF UNIT PRODUCTION COSTS

The determination of the quantities of various inputs used in building materials making process (step 1 to 5)

Step 1: Determination of the number of building materials (block, bricks, etc.) to be produced in a given time. The number will be a function of market demand, availability of funds, adopted manufacturing techniques, etc.

Step 2: Estimation of quantities of the various materials inputs for the adopted scale of production.

Step 3: Compilation of a list of required equipment, including spare parts and servicing equipment The list should also include transport equipment whenever necessary as well as testing equipment. The cost of industrial pieces of equipment may be obtained from equipment suppliers and manufacturers or from local workshops in case the equipment can be manufactured locally. Both locally made and imported equipment.

Step 4: Labour requirements. The productivity of the labour force may not only vary from one country to another, but also from one site to another within the same country. It is necessary to specify the number o shifts per day, the length of working day, the number of days worked per week and the number of working weeks per year, taking into account an allocation of time for leave of absence, all within any conditions agreed between unions, employers, etc. The level of skill requirements must also be specified.

Step 5 : The local infrastructure required must be determined. It may include:

- land for exploitation of the quarry;
- land for access and buildings;
- land for storage of raw materials and of product;
- buildings required, such as covered areas for making, drying or firing; offices; and other amenities.

Step 6 : Working capital. Apart from purchase of land and equipment, it is necessary to have sufficient initial inancial resources to enable the purchase of raw materials, including fuel. Working capital will also be required for the payment of wages during an initial period, and for the building up of a stock of product for sell. It is recommended that sufficient working capital be available for two months' materials and fuel, and one month's salaries. If difficulties are anticipated in obtaining supplies of any particular commodity, it may be necessary to hold a stock sufficient for a period longer than one month.

Step 7 : Calculation of depreciation costs of equipment and buildings. Whatever the type of equipment used, it will have a limited life. An estimate must be made of the annual depreciation costs for separate equipment items. The depreciation cost of buildings must also be estimated. These costs will depend on the initial purchase price, the life of equipment and buildings and the prevailing interest rate. Table 7 may be used to estimate these depreciation costs. It gives the discount factors (F) for interest rates up to 40 per cent and expected life periods up to 25 years. Thus, if Z is the purchase price of the equipment or the cost of the building, the annual depreciation cost is equal to Z/F.

Hence, the longer the useful life, the lower the annual depreciation cost, and the higher the prevailing interest ratel, the higher this cost.

The C. I. F. prices of imported pieces of equipment may be obtained from local importers or equipment suppliers. The prices of local equipment and buildings may be obtained from local contractors and equipment suppliers. The prices of local equipment and buildings may be obtained from local contactors and equipment manufacturers.

Step 8 : Land has an infinite life, and the area which raw materials are obtained may be restored to its original use in some instances. Thus, the annual cost of land may be assumed to be equal to the annual rent of equivalent land. Alternatively, if land is already owned by the entrepreneur, a hypothetical annual rental rate should be used when estimating the annual land cost, since this is the income he might have obtained by renting it out instead of using the land himself.

Step 9 : The annual cost of consumable items identified in Step 2 must be calculated. Clay, sand and water are often extremely cheap commodities. The only

Table 7
Discount factor (F)

Year	Interest rate (percentage)																	
	5	6	8	10	12	14	15	16	18	20	22	24	25	26	28	30	35	40
1	0.952	0.943	0.926	0.909	0.893	0.877	0.870	0.862	0.847	0.833	0.820	0.806	0.800	0.794	0.781	0.769	0.741	0.714
2	1.859	1.833	1.783	1.736	1.690	1.647	1.626	1.605	1.566	1.528	1.492	1.457	1.440	1.424	1.392	1.361	1.289	1.224
3	2.723	2.673	2.577	2.487	2.402	2.322	2.283	2.246	2.174	2.106	2.042	1.981	1.952	1.923	1.868	1.816	1.696	1.589
4	3.546	3.465	3.312	3.170	3.037	2.914	2.855	2.798	2.690	2.589	2.494	2.404	2.362	2.320	2.241	2.166	1.997	1.849
5	4.330	4.212	3.993	3.791	3.605	3.433	3.352	3.274	3.127	2.991	2.864	2.745	2.689	2.635	2.532	2.436	2.220	2.035
6	5.076	4.917	4.623	4.355	4.111	3.889	3.784	3.685	3.498	3.326	3.167	3.020	2.951	2.885	2.759	2.643	2.385	2.168
7	5.786	5.582	5.206	4.868	4.564	4.288	4.160	4.039	3.812	3.605	3.416	3.242	3.161	3.083	2.937	2.802	2.508	2.263
8	6.463	6.210	5.747	5.335	4.968	4.639	4.487	4.344	4.078	3.837	3.619	3.421	3.329	3.241	3.076	2.925	2.598	2.331
9	7.108	6.802	6.247	5.759	5.328	4.946	4.772	4.607	4.303	4.031	3.786	3.566	3.463	3.366	3.184	3.019	2.665	2.379
10	7.722	7.360	6.710	6.145	5.650	5.216	5.019	4.833	4.494	4.192	3.923	3.682	3.571	3.465	3.269	3.092	2.715	2.414
11	8.306	7.887	7.139	6.495	5.938	5.453	5.234	5.029	4.656	4.327	4.035	3.776	3.656	3.544	3.335	3.147	2.752	2.438
12	8.863	8.384	7.536	6.814	6.194	5.660	5.421	5.197	4.793	4.439	4.127	3.851	3.725	3.606	3.387	3.190	2.779	2.456
13	9.394	8.853	7.904	7.103	6.424	5.842	5.583	5.342	4.910	4.533	4.203	3.912	3.780	3.656	3.427	3.223	2.799	2.468
14	9.899	9.295	8.244	7.367	6.628	6.002	5.724	5.468	5.008	4.611	4.265	3.962	3.824	3.695	3.459	3.249	2.814	2.477
15	10.380	9.712	8.559	7.606	6.811	6.142	5.847	5.575	5.092	4.675	4.315	4.001	3.859	3.726	3.483	3.268	2.825	2.484
16	10.838	10.106	8.851	7.824	6.974	6.265	5.954	5.669	5.162	4.730	4.357	4.033	3.887	3.751	3.503	3.283	2.834	2.489
17	11.274	10.477	9.122	8.022	7.120	6.373	6.047	5.749	5.222	4.775	4.391	4.059	3.910	3.771	3.518	3.295	2.840	2.492
18	11.690	10.828	9.372	8.201	7.250	6.467	6.128	5.818	5.273	4.812	4.419	4.080	3.928	3.786	3.529	3.304	2.844	2.494
19	12.085	11.158	9.604	8.365	7.366	6.550	6.198	5.877	5.316	4.844	4.442	4.097	3.942	3.799	3.539	3.311	2.848	2.496
20	12.462	11.470	9.818	8.514	7.469	6.623	6.259	5.929	5.353	4.870	4.460	4.110	3.954	3.808	3.546	3.316	2.850	2.497
21	12.821	11.764	10.017	8.649	7.562	6.687	6.312	5.973	5.384	4.891	4.476	4.121	3.963	3.816	3.551	3.320	2.852	2.498
22	13.163	12.042	10.201	8.772	7.645	6.743	6.359	6.011	5.410	4.909	4.488	4.130	3.970	3.822	3.556	3.323	2.853	2.498
23	13.489	12.303	10.371	8.883	7.718	6.792	6.399	6.044	5.432	4.925	4.499	4.137	3.976	3.827	3.559	3.325	2.854	2.499
24	13.799	12.550	10.529	8.985	7.784	6.835	6.434	6.073	5.451	4.937	4.507	4.143	3.981	3.831	3.562	3.327	2.855	2.499
25	14.094	12.783	10.675	9.077	7.843	6.873	6.464	6.097	5.467	4.948	4.514	4.147	3.985	3.834	3.564	3.329	2.856	2.499

significant part of their cost, in comparison wit that of fuel, is thatincurred in extracting and transporting them. Thus, the cost of sand and clay is often included in the cost of labour, land rental rate and equipment depreciation costs. Fuel costs are of major importance and must be determined locally by examining current market prices.

The estimation of the cost for each input, and that of the unit production cost (step 6 to 12)

Step 10 : The cost of labour varies greatly from one country to another. They must thus be calculated on the basis of local wage rates. The labour requirements are those identified in Step 4.

Step 11 : Working capital raised for the project will require an allowance in the annual costs for interest payments to be made on that capital.

Step 12 : The total annual cost consists of the sum of the separate annual costs itemised in Steps 7 to 11.

Total annual cost =

Depreciation costs of equipment and buildings +
Annual land rental cost +
Annual labour costs +
Annual fuel costs +
Annual costs of sand and clay (if the latter are purchased rather than won on land belonging (or rented) by the producer) +
Annual cost of water (if the latter i.e. purchased rather than pumped from a river or well within the production unit) +
Annual cost of electricity (if used) +
Annual interest payments on working capital.

The unit production cost of building material is then equal to :

Total annual cost/Annual output

The use of the above methodological framework is illustrated in Annex III by a real production of stabilized soil blocks in Kenya. Individual cost items are expressed in Kenya shillings (1983).

4) Risk and return on investment

60. There are two key decision factors which govern the production of indigenous building materials risk and expected return on investment. The entrepreneur must weigh these two factors, balancing one against the other. The ability of the entrepreneur to accurate assess these factors is a key to success or failure in development.

61. The risk that expected returns on any project will not materialize is an ever present reality in the production of indigenous building materials. It is a factor evaluated by all parties to small-scale building materials production. The entrepreneur, when he invests his time and resources, must consider the possibility that the project will (a) abort before it can be implemented or (b) cost more or return less than anticipated. A lender must determine the likelihood that part (or possibly all) of his money might not be returned in the timely fashion he expects. A government (local, regional, etc.), for its part must be on guard against a situation where the project is begun by the entrepreneur but not completed with a result that costs and services might be required of the government. All these determinations define the risk that parties to the production of indigenous building materials must bear. Risk is compensated in a number of different ways. Entrepreneurs or equity participants receive profits or other forms of return on their investments. Lenders collect an interest charge, part of which reflects the uncertainty of the return. Governments reach their goals in employment, income distribution, development of backward regions, etc. Risk is an inevitable aspect of small-scale building materials production. It cannot be eliminated and it cannot be excluded from consideration in decision-making. Clearly, risk also provides governments an important level with which to influence the direction and course of entrepreneur's activities. By entering an undertaking of the establishment of a new small-scale plant and alternatively offering inducement to reduce the risk involved in a particular project, making it more attractive than other alternatives, or throwing up constraints which increase the degree of risk involved with a particular option, governments can effectively influence certain decisions. This fact should not be overlooked or avoided by governments : it provides a valuable opportunity to use the mechanics of the market and the entrepreneur's motivations to serve governmental goals. Annex IV shows governmental measures aimed at the reduction of the entrepreneur's risk involved in small-scale production of local building materials. Annex V lists measures at international level designated for the reduction of the entrepreneurs' risk involved in small-scale production of local building materials.

62. One of the most difficult concept for a newcomer to small-scale sector to understand is return on investment. The investment

in building materials venture can come in many forms: capital, land, entrepreneurship. Those providing these means of production demand many types of return. Landowners, for example, might desire affixed income stream. To meet these various objectives of the owners of the means of production, the entrepreneur puts together a 'package' of different types of benefits that will flow from the project. He then offers these in payments to the owners of resources. The types of return available are numerous. They include interest,which is a fixed payment to suppliers of capital or land held under a mortgage, profit, which is the residual of all revenues less all expenses, payable to equity participants; tax losses, which are distributable to equity partners and constitute the amount of loss generated on paper during construction or after completion as a result of depreciation; or cash flow, which represents cash actually generated by a project. These and others are the returns that flow from a project. Each can represent a form of profit maximization for the owner of a resource.

63. As far as the entrepreneur is concerned, the investment criterion is the financial return on the invested capital, that is, the profit. Consequently, the investment profitability analysis consists essentially of determining the ratio between the profit and the capital invested. The simple rate of return method relies on the operational accounts. It is defined as the ratio of the profit in a normal year of full production to the original investment outlay/total capital investment. The simple rate of return thus becomes :

$$R = \frac{\text{Annual Return x 100}}{\text{Total Capital Investment}}$$

where Annual Return = Gross Annual Income (Sales) - Annual cost of Production.

64. The use of the methodological framework for financial and economic evaluation including the determination of the basic components of investment and production costs of a project and its profitability is illustrated in the example of predesign cost estimates to project proposal on manufacture of wood wool boards at small-scale level in India (see Annex VI). The simple rate of return method can be a way to judge project alternatives on their own merits, assuming equal conditions for loan financing. Moreover, the profitability of the total investment can be compared with the going rate of interest in the capital market. Financial calculations are always bases on expected market prices of inputs and outputs.

5) Selection of project alternatives

65. The feasibility analysis should search for alternatives as it would be highly unsatisfactory to present only one proposal. In the case of only one proposal the choice would then only be 'yes' or 'no', with no certainty that the most economic proposal possible was being considered. The method for judging project alternatives is illustrated above. Project alternatives should be regarded as different and mutually exclusive technical solutions. In general, the following alternatives exist :

- Different production processes either for the same building material (these processes, in turn, are influenced by the technical process, the equipment as well as the materials and inputs used), or for different types of intermediate and raw materials;

- Different scales of production;

- Different locations and sites;

- Different project implementation scheduling, caused, for example, by scarcity of funds.

Obviously the number of alternatives should not be very large to avoid extra expenditures to analyze and compare them all.

6) Pay-back-period

66. A useful supplementary tool in some cases for project selection is the method of calculating the pay-back period. The pay-back period is defined as the period required to recuperate the original investment outlay through the profits earned by the project 'profit' is defined as net profit after tax, adding financial cost and depreciation. The project is assumed to be operating at full capacity for the periods considered, which means that normally only the third year of operation can be used for these calculations. In the example below, the calculation of the pay-back period is as follows (Imaginary Project):

Item	Year 3	 4	 5	 6	 7
Net profit	- 280	920	1270	2540	2630
Interests	370	330	280	180	90
Depreciation	780	780	780	780	780
'Profit'	870	2030	2330	3500	3500

Calculation of pay-back period

	Value (US$)
1. Total investment costs	10 300 (8000) 3/

2. Annual net profit plus interest plus depreciation

	Amount paid back (= 'profit')	Balance at end of year
Year 1	-	10 300 (8000)
Year 2	-	10 300 (8000)
Year 3	870	9 430 (7130)
Year 4	2030	7 400 (5100)
Year 5	2330	5 070 (2770)
Year 6	3500	1 570
Year 7	3500	

The calculation indicates that the original investment costs will be recovered after as a little than 6.5 years.

67. A single project proposal may be accepted if the pay-back period is smaller than or equal to an acceptable time period; this period is usually derived from past experience with similar projects.

3/ Figures in brackets refer to calculation of the pay-back period while disregarding the value of land ($300) and of working capital ($2,000) which are deducted from the total investment costs on the assumption that these values can be fully regained at the end of the project. In this case the pay-back period would be 5.2 years.

68. The major merit of the pay-back period as a project selection criterion is its easy calculation. It is particularly useful for risk analysis, which is relevant in politically unstable countries and in the countries where building materials industry faces rapid technological obsolescence. The main shortcomings of this method are that it does not consider what will happen once the project has paid for itself and that it over emphasizes quick financial returns. Furthermore, this method does not measure the profitability of the project proposal but mainly concerned with its liquidity.

III. IMPLEMENTATION STAGE

A. Promotional activities

69. Project promotion starts with the decision to identify potential sources of finance, marketing and other inputs that are required for successful project development. Thus, promotion may involve the search for local sponsors, private or public partners, various sources of finance etc. Project promotion should start as soon as possible once the opportunity study or, even better, the feasibility analysis has demonstrated preliminary project viability.

70. To avoid a lack of integration with the other equally vital elements of the project cycle, in particular with those of implementation and operational phases, it is recommended to prepare a work plan for the project. How detailed the plan should be is determined by the complexity of the proposed business and the need for communicating the plan to others such as partners, suppliers, financing sources, etc. A timetable with bars provides a simple way of showing the activities of the project. This helps to make sure that everything will be done and ready at the right moment. Annex VII shows an example of a work plan for pozzolime project which was proposed for implementation in Tanzania. For each activity there is a bar or line to show when something will be done and how long it will take to do.

B. Financing

71. As a result of the enormous expense of most building materials projects, it is unusual for any small-scale entrepreneur or group of individuals to supply of the funds necessary to undertake a project. Hence, financing concerns are of paramount importance to commercial production of local building materials to be undertaken by small scale entrepreneurs, village co-operatives, housing co-operatives, small scale development agencies or by specialized agencies. It follows that getting finance is a factor that needs to be managed. Smaller enterprises often lack the in-house competence to deal with financial issues. Instead they use legal,

accounting or banking advisers who sometimes can offer valuable assistance. But assistance cannot replace management. Getting finance is a critical factor for business success. It is the entrepreneur's responsibility that finance available as needed and at terms and conditions conducive for enterprise's development.

1) Equity vs. Debt

72. Funds for development of building material projects are raised by two basic methods: equity and debt financing. Almost all projects require both types of financing. Equity financing generates funds through the sale of entrepreneurial interests in a project. Normally, this method entitles as individual or group to a share of a project's ultimate profits. Because of the high risk involved in a project (lower returns and relatively long cost repayment periods, high initial capital outlay for capital intensive projects and demand uncertainties resulting from fluctuations in construction output) equity investors often demand a substantial return. For entrepreneur this financing tool involves giving up part of his ownership interest in a project. Debt financing relates to borrowed funds. Rather than requiring an equity interest in exchange for funds, this method is designed to repay the borrowed amount at a fixed rate of return. The amount of this return is a function of the capital and the perceived risk of the project. Since a project must demonstrate a sufficient degree of viability in order to obtain borrowed funds, the risk assumed by the lender is generally less than for the equity investor.

73. The debt-equity ratio is an indicator of the financial risk that a new project faces, and compares borrowed and owned funds. Financial prudence sets certain norms for this ratio. The debt-equity ratio is also a measure of entrepreneur leverage. The smaller the equity capital, the higher the income per unit share. Equity owners therefore favour high debt-equity ratios since such ratios give leverage to equity capital, and allow equity owners to control projects even with a small amount of capital. This approach is shown below through an example of two different ways to finance the same project.

Example of Leverage	1	2
Total capital requirements	20	20
Debt capital (mortgage amount)	14	19
Equity capital (cash invested)	6	1
Net profit from operations before paying interest on debt	2.4	2.4
Interest on debt (at 10 per cent rate)	1.4	1.9
Net profit after interest is paid on the debt	1.0	0.5
Return on equity capital (cash invested)	16.6%	50.0%

The ability to raise return on cash invested from 16.6 per cent in the first example to 50 per cent in the second, through borrowing more heavily to finance the project, is called leveraging.

74. Investment bank asks for a sound debt-equity ratio, since the largest portion of equity capital is always tied in land, buildings and equipment which can be liquidated only with difficulty or only at a loss in case of bankruptcy of the project Banks therefore frequently refuse to finance a project with loans greater than the amount required investment outlay.

2) Equity financing

75. It is usual to turn to friends and relatives to augment entrepreneur's investment. There are also sometimes well-to-do outsiders who might be willing to help start a new small-scale local building materials production. They can be former employers or other businessmen whose business enterprises might be furthered by the new undertaking. One can also turn to financial institutions such as the Development Finance Corporation of Kenya (DFCK) or the Kenya Industrial Estates Ltd. (KIE) whose statement of policy enables them to take up equity (up to 25 per cent in the case of the KIE) in new enterprises. Generally speaking, friends, relatives and other individual sponsors are the more desirable sources of equity capital for start-up. They do not have formal investment evaluation criteria. Instead they rely on their assessment of the character of the businessmen who asks for equity support. Wealthy associates will want to actively monitor their investment. Their personal contacts and business experience can be a valuable added advantage for an emerging enterprise. An

alternative to funding by shareholders or other direct investors is the utilization of indirect risk capital. Business associates may agree to offer securities to guarantee a new enterprise's obligations vis-a-vis banks or other institutions. In return they expect a certain share of the profit. The alternative is fairly often used by small industries companies in Kenya.

76. There are a variety of organizational forms through which small scale building material enterprises may be owned. The options include direct ownership, partnerships, and others. Differing legal and tax consequences often determine which of these entities is used. Following is a brief description of the major types.

a. Direct ownership

The direct owner of a project, called the sole proprietor, is legally entitled to all profits, is personally responsible for all liabilities, and is the beneficiary of any and all tax benefits. He holds individual control over the direction and ultimate management of the project and must rely on his own expertise, except to the extent that he employs others to provide it. Direct ownership affords the opportunity to receive the greatest benefit from successful operation of the project. It also bears the greatest burden of risk. Sole proprietorship is the most simplistic, yet a most common form of equity participation in development of entrepreneurship. It is limited generally to very small projects where equity cash needs are not great and where tax benefits are limited.

b. Partnership

This is a general term encompassing many forms of organization. It includes joint ventures, and any other unincorporated association of two or more people. It is an entity under the law and as such can own and develop property in its name. Its primary function is to serve as conduit. Monies flow from the partners to the organization to buy equipment. Monies flow back to the partners as cash flow and as tax losses. This element of pass through is the major asset of the partnership. Partners receive and declare profits and losses based on their percentage share of the partnership's profit or loss. No separate entity stands between. The most significant feature of a general partnership is that each partner is personally responsible for all debts and liabilities. To the extent that a project is successful, a general partner shares proportionately in the profits based on his share. To the extent, however, that it might be unsuccessful he could carry the burden of the whole. A general partner can bind the other general partners. A variation of the partnership form is the limited partnership. A limited partnership contains at least two members, one of whom is a general partner. The limited partnership has a fixed percentage interest in the project. His liability is restricted to that of his investment as spelled out in the partnership agreement. Action of the general partner(s) does not effect these liabilities. Partnerships are a very flexible tool for generating equity capitals. Individual investor needs can, to a degree, be met. As an example, the division of cash can often be different than the division of tax loss.

3) Debt financing

3.1 short-term debt money

77. The most widely used forms of borrowed funds are short-term supplier credit and bank overdrafts. This applies to all stages of an enterprise's development. But the need for both forms of debt money is particularly acute during start-up. Unfortunately, amongst whole-sellers and bankers, lack of personal acquaintance and, hence, confidence will restrict their willingness to lend to new enterprises. Start-ups must establish their competence and business integrity. Bankers and, to some extent, suppliers will also pay attention to the borrower's equity and overall financial position. But the emphasis will soon shift from these more formal criteria to consistent earnings and a record of payments as agreed. Thus, with suppliers and bankers, confidence is the most important factor. It effects the amount of credit that can be made available and its terms and conditions.

78. Emerging businessmen will find that most suppliers will cooperate if they are honestly informed and if the clients are known to honour their commitments. Stated differently, an entrepreneur should be careful not to cheat on facts and doubly careful in unilaterally obtaining credit. The confidence factor aside, commercial banks will ask for securities for overdrafts and other working capital loans. Title deeds are normally used for this purpose and it is usual to request personal guarantees from small enterprise owners. This applies to all business but in particular to those with the following characteristics:

- little equity at risk;
- no track record that can be easily verified
- high dependency on the owner's ability to run the business himself
- no clear separation of the enterpriesse's finances from the ones of the owner.

In all these cases the personal gurantee serves as a proof of the owner's commitment to his enterprise. As the business grows, the guarantee will become less and less important.

3.2) Long-Term Loans

79. The traditional sources of funds for production on a commercial scale of proven building materials are the development finance institutions such as industrial development banks, national investment banks as well as specialised housing banks. Finance for commercialisation of local building materials however is not likely to come easily from such banks. Special arrangements are therefore required. In Tanzania, for instance, the National Bank of Commerce extends through its Small Scale Industries Department its financial assistance to small scale production of building materials on the basis of project's viability and established criteria. In line with national economic/developmental priorities in selecting small scale projects for possible financing the Bank gives particular consideration to projects which are:

- more labour intensive;
- export oriented (for purposes of earning foreign exchange)'
- import substituting;
- predominantly/wholly based on locally available raw materials;
- able to convert industrial waste or other types of waste into usable products;
- likely to give a substantial social/development impact in their locational areas;
- demonstrating a good potential capacity to generate input into other industries (or conversely, potential capacity to use outputs of other industries).

80. In Kenya, special arrangements for the provision of very small enterprises with long-term funds involve mainly government-assisted programmes such as the one operated by the Kenya Commercial Bank (KCB) or by the Cooperative Bank. Other long-term funding arrangements available from the private sector include leasing contracts or loans which can be secured with a separate income earning property. Generally, applicants will find that the appraisal and approval process requires extensive documentation and tends to be rather lengthy. Long-term lenders or the private sector insist on highly protective terms and conditions. To overcome the shortage of long-term funds, the Kenya government has set up a number of specialised financial institutions which combine funding with certain other forms of technical assistance. KIE and the recently established Small Enterprise Finance Company (SEFCO) of the DFCK qualify as the major sources for long-term loans to small industry. Their funding is available for periods of up to ten years and the borrowers are given grace periods during which only interest is to be paid. Grace periods cover at least the project implementation and often part of the start-up phase.

81. Another source of financing building materials production is through industrial development organizations in the small-scale sector, which some countries in Africa have set up to fulfil the following functions:

- to advise on setting up small scale plants including the choice of technology, design, plant layout, etc,:

- to prepare feasibility studies, select related machines and equipment;

- to provide or assist in mobilizing financial resources for the establishment of industries in the small-scale sector;
- to advise entrepreneurs with proper methods of business management and to provide and promote training facilities and programmes for entrepreneurs or employees of small-scale industries.

In Tanzania, the Small Industries Development Organization (SIDO) was set up in 1973 to promote the development of small scale industries. To date SIDO has been involved in lime pozzuolana projects, construction of 16 lime kilns, popularisation of clay roofing tiles as well as in sisal fibre/cement roofing sheets.

C. Plant design and construction

82. The whole range of activities from the design of a new small-scale plant for the production of local building materials, its construction of a building and the installation of machinery and equipment should be considered part of the basic orientation training of all entrepreneurs. Plant design and construction must proceed in a series of logical steps, each of which takes a certain time to complete. Some of these steps can be taken in parallel, others must be in series, so that the commencement of one step depends on the completion of another. In the simple plant-construction example the foundations must obviously be designed before they can be constructed, but they can only be designed after final decisions have been made on the choice of equipment, layout of the plant and the design of the structure. The number of activities and the sequence in which they must be carried out are usually shown in the outline project programme for plant design and construction (see Fig. 2).
The implementation of plant design and construction programme usually incorporates the following activities and the sequence in which they must be carried out:

1) General

1.1) Appointment of planning team responsible for project management and control.

83. It is essential to appoint a planning team at the beginning to direct and control the project. If the team decide their own

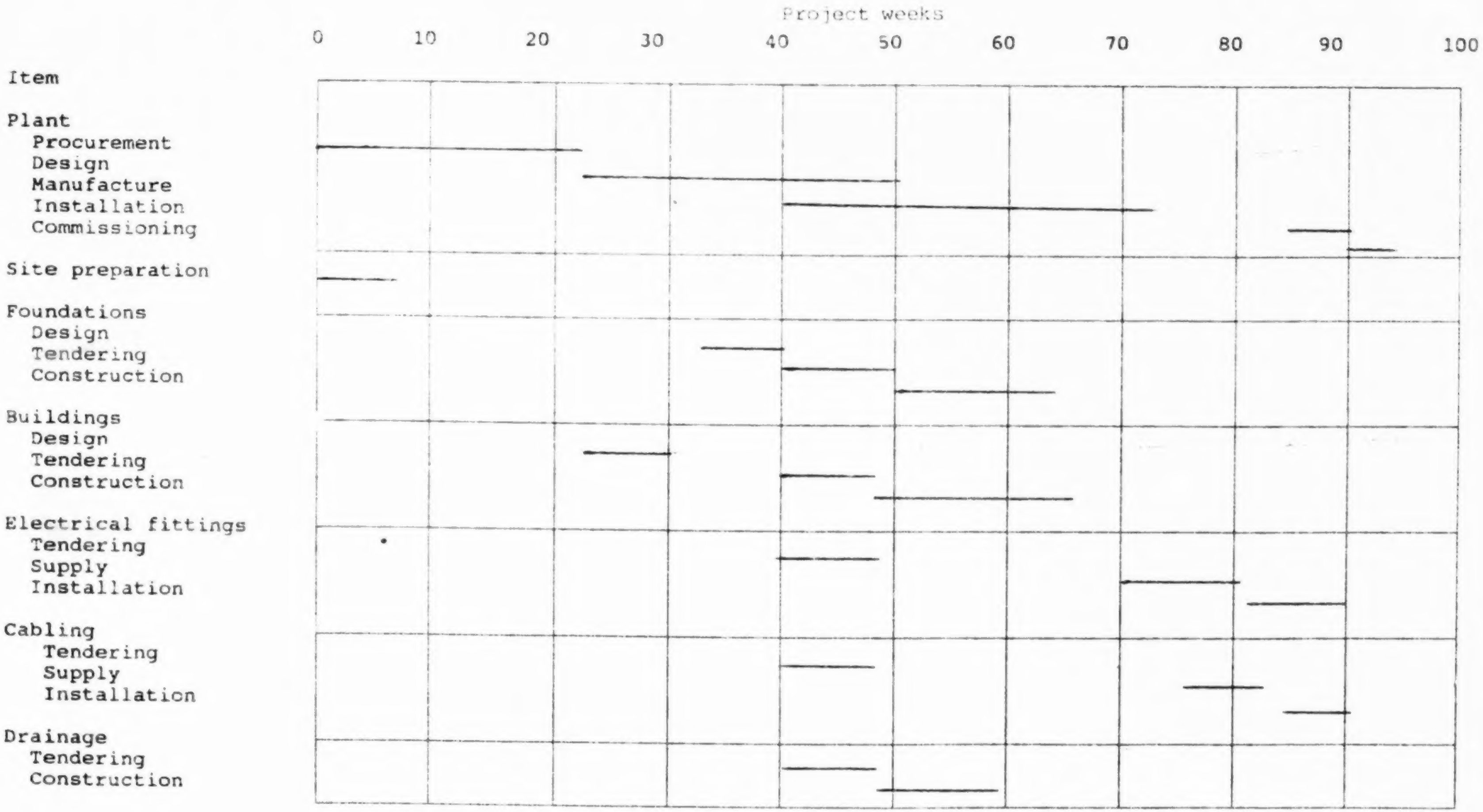
resources are inadequate it is then that a decision must be taken on the appointment of a consulting engineer.

1.2) Carrying out geodetical, geological, hydrological, soil and other surveys.

1.3) Site acquisition.

84. Following the selection of a desirable site, entrepreneurs must focus their efforts on its acquisition. This can be accomplished in different ways through the use of legal devices

Figure 2. Outline project programme for construction



that can provide for the ownership or the control of land. How entrepreneurs proceed depends on their particular needs. Although a site has been selected, the overall viability of a project may well be uncertain. Planning, various administrative approvals, and financing arrangements are some of the factors which may be incomplete. Before these are satisfactorily resolved it may not be advisable for an entrepreneur to make any permanent or long term commitment on a piece of property. In this pre-development stage, therefore, it is often advisable to be able to control a site without actually owning title to it. An option agreement serves this function. It enables an entrepreneur, at a relatively minimal cost, to reserve a desired parcel of land. The agreement usually extends for a predetermined length of time during which an entrepreneur has the right to purchase the land from its owner at a specified price. When a decision to undertake a project has been finalized, a more enduring control mechanism is necessary. One obvious possibility is the outright purchase of a parcel of land. Purchasing prime development land, however, involves a substantial expense. While the cost may be mitigated through various deferred payment schemes, it may still be prohibitive. As a result, other alternatives for controlling land are often investigated and utilized by an entrepreneur. One such possibility is the lease. Through a leasing arrangement, an entrepreneur can acquire the right to use a parcel of land for a specified period of time. In return for this right, the developer pays the owner rent. Such an approach eliminates a major front end cost imposed on the entrepreneur at a time when capital is likely to be a serious constraint. Very often, land leases will contain a provision allowing the entrepreneur to purchase the land at a later date when his capital is more plentiful.

85. Another possible land control device is the joint venture. It operates through a partnership which is formed between a landowner and an entrepreneur. The landowner contributes his property and the entrepreneur provides his expertise and money. When the project is competed the landowner is paid for his parcel out of the proceeds from the sales and profits. Like the lease, the joint venture provides necessary control while minimizing front end capital requirements.

1.4) Process design and layout.

86. Project charts and layouts define the scope of the entire project and serve as a basis for detailed engineering work to estimate the investment and production costs. The types of charts and layouts, and the degree of detail depend on the size and technical sophistication of the project. When preparing layouts, data should be available on the size of the market, the estimated plant capacity, the supply base of the project, the conditions prevailing at the plant site, and the required technology, equipment and civil works. The sequences of production stages are

represented in the form of a flow chart. See Fig. 3, which is an example of tiles making flow chart. Project layout drawings are prepared by fitting functional operations into conditions actually prevailing at the site. Fig. 4 shows all operations of manual brick production and the layout of production area. Project layout drawings should indicate the actual arrangement and main dimensions of:

- Major equipment;
- Structures and buildings;
- Roads and various utility lines;
- Areas for further extension.

Figure 3. Flow Sheet Diagram for the Manufacture of Clay Tiles

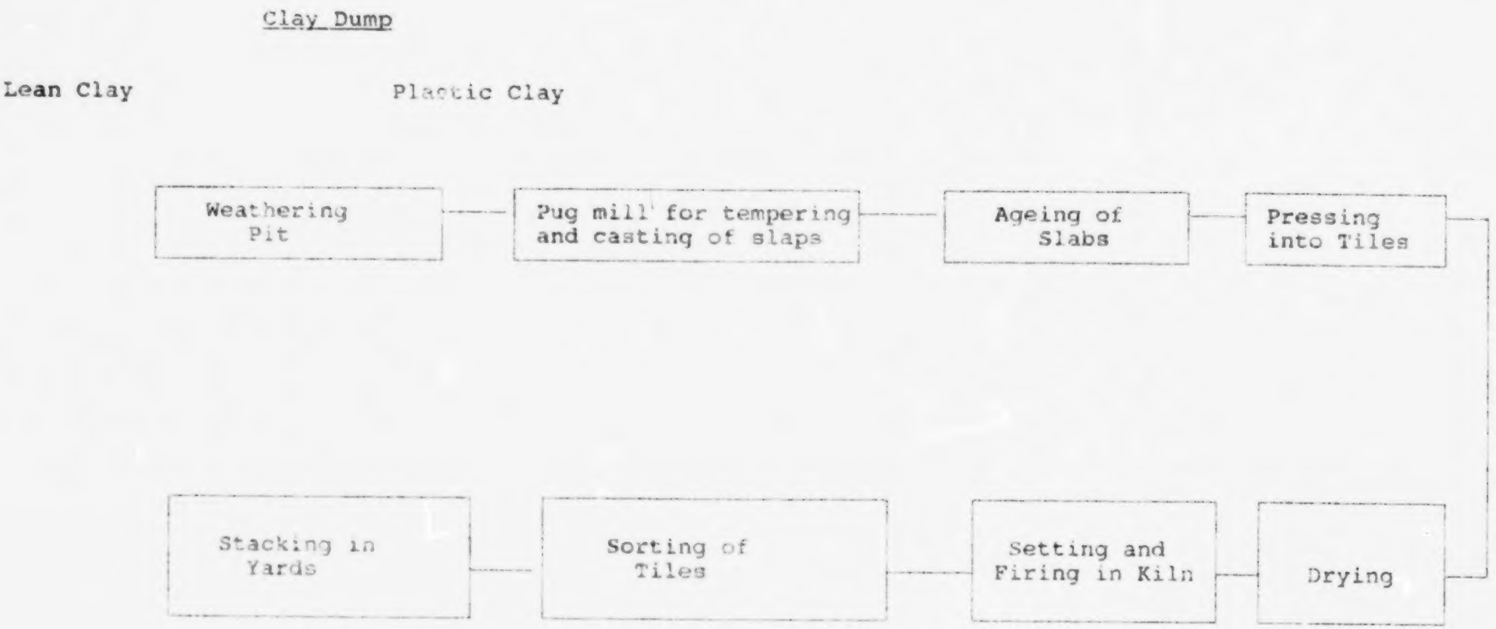
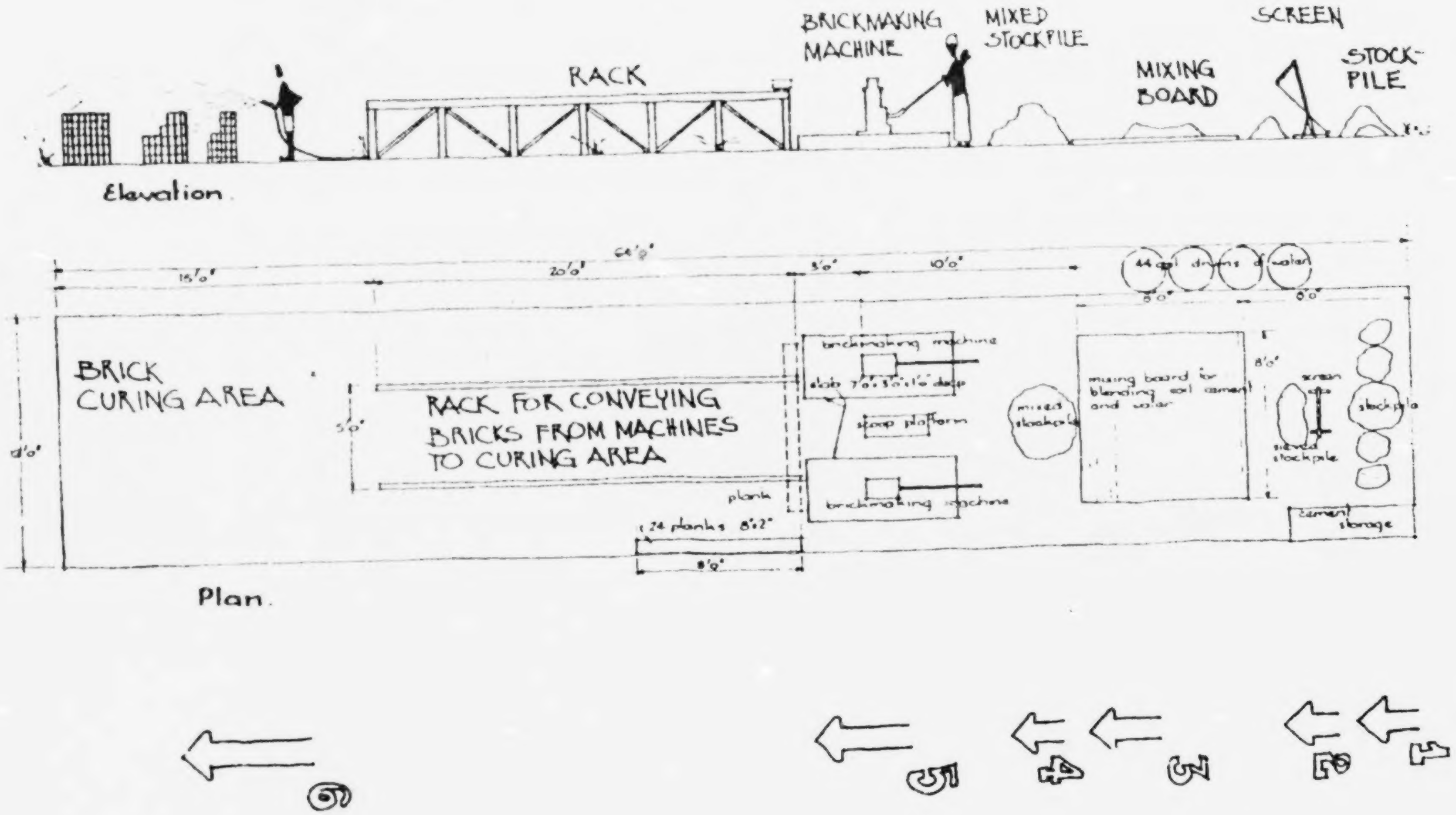

Clay Dump
Lean Clay
Plastic Clay
Weathering Pit
Pug mill for tempering and casting of slaps
Ageing of Slabs
Pressing into Tiles
Drying
Setting and Firing in Kiln
Sorting of Tiles
Stacking in Yards

Figure 4. Lay out of manual brick production area


BRICKMAKING MACHINE
MIXED STOCKPILE
SCREEN
RACK
MIXING BOARD
STOCK-PILE
Elevation.
64'0"
15'0"
20'0"
3'0"
10'0"
44 gal drums of water
5'0"
6'0"
BRICK CURING AREA
RACK FOR CONVEYING BRICKS FROM MACHINES TO CURING AREA
5'0"
8'0"
brickmaking machine
slab 7'0"x3'0"x1'0" deep
stoop platform
brickmaking machine
plank
24 planks 8'x2"
8'0"
mixed stockpile
mixing board for blending soil cement and water
8'0"
screen
sieved stockpile
stockpile
cement storage
Plan.
1
2
3
4
5
6

Physical layout drawings are based on maps showing the results of geodetical, geological, hydrological, soil and other surveys. The scale of such layouts varies between 1:1000 and 1:200 depending on the size and complexity of the project.

1.5) Obtaining development permission from local authority.

2) Plant

2.1) Preparation of inquiry documents for plant.

87. To simplify the plant-construction example it is assumed that it was decided to purchase all the equipment from one vendor. In the case of more than one vendor the activities are repeated for each vendor, consequently increasing the work of the entrepreneur.

2.2 Selection of vendors (manufacturers) to whom inquiry is to be sent
2.3 Preparation of tenders by (entrepreneur) vendors
2.4 Appraisal of tenders by entrepreneur
2.5 Contract negotiation with selected vendor
2.6 Obtaining authorization from exchange-control authorities for payments in foreign currency.

88. Under the regulations of most countries exchange-control approval, assuming that it is required, cannot be formally requested until contract is signed, although an informal indication is often given that the proposed payment terms are acceptable. However, the contract would not come into force until such approval had been obtained.

2.7) Issue of Letter of Credit and making down payment (if any)

89. The plant-construction example is based on a cash transaction that normally provides for a 10-15 per cent cash-down payment, a further payment of 70-80 per cent on delivery and the balance on possession of the equipment by the entrepreneur. Again, the contract coming into force would be conditional on receipt by the vendor of the down payment and establishment of a Letter of Credit. If the contract is on a credit basis, instead of a Letter of Credit there should be an item for issue by the vendor, and acceptance by the entrepreneur, of bills of exchange or promissory notes. In this case the contract would not come into force until the entrepreneur and vendor had obtained approval from their appropriate financial authorities on the terms of payment.

2.8) Issue of performance bond by vendor
2.9) Approval by the entrepreneur of vendor's equipment layout

90. The entrepreneur may have approved the vendor's layout of equipment during contract negotiations but, if not, it should be done as soon as possible after signature of the contract.

2.10) Submission by vendor of data needed for civil engineering design, including requirements for site services.

91. The importance of defining this as a definite activity is apparent. It is also important that the vendor's contract should contain a clause regarding information to be supplied by him and date by which it should be supplied after signature of contract.

2.11) Submission by vendor of pro forma invoices needed for import licences
2.12) Obtaining import licences by entrepreneur

92. When an import licence is required it can usually only be obtained by the entrepreneur if he receives correctly prepared pro forma invoices from the vendor for the items to be imported. The date after signature of the contract by which these should be supplied be stated in the vendor's contract; a specimen copy of the form in which the invoice is required should be annexed to contract to avoid errors in documentation and possible importation delays.

2.13) Manufacture of equipment by vendor
2.14) Shipment of equipment
2.15) Clearance of equipment through customs

93. Customs clearance can be a lengthy affair unless precautions have been taken to ensure that all the necessary permissions have been obtained from the appropriate authorities and that all the documentation is in the correct form. Responsibility for obtaining customs clearance should be clearly defined in the vendor's contract. However, even if the responsibility is placed with the vendor it is suggested that the entrepreneur, in his own interests and because of his greater local knowledge and contracts, should provide every assistance to ensure that the equipment is not delayed in its delivery to site.

2.16) Arrival of equipment on site
2.17) Equipment installed ready for test

3) Civil engineering and building work

3.1) Preliminary preparation of inquiry documents

It is suggested that as much as possible of the inquiry documentation for the civil engineering and building work should be prepared before receiving the final data from the vendor of the equipment. In the example given it has been assumed that all the civil engineering and building work, including site services, is to be included in one contract with a local contractor.

3.2) Selection of local firms to tender
3.3) Finalization of inquiry documents after receipt of data from equipment vendor

94. Estimates should be prepared for the costs of civil works and building structures bearing in mind the selected site, site conditions, selected technology and equipment. To cover all parts of the construction programme. They should be divided into three categories:

Site preparation and development;
Buildings;

Plant or process buildings
Ancillary buildings, such as maintenance buildings, garages and others
Stores and warehouses for supplies, finished and semi-finished products, tools, spare parts, etc.

Outdoor works.

When undertaking such estimates, detailed drawings should be prepared to supplement the layout drawings in order to compute all quantities. Different scales should be selected depending on the technical difficulties and on the sophistication of the project. In most cases, scales of 1;200 and 1:100 will be sufficient. The quality of the construction materials to be used and the levels of workmanship should be specified. Next, quantity surveys should be made based on drawings and specifications. The quantities to be surveyed should correspond to the prices used for the cost estimates. Cost estimates for buildings and civil engineering works should be based on unit and/or cost parameters such as the square metres of a built-up area or the cubic metres of the enclosed space of a building. These may be obtained from existing comparable values for equal or similar works or by obtaining suitable quotations from contractors.

3.4) Preparation of tenders by local firms
3.5) Appraisal of tenders by entrepreneur
3.6) Contract negotiation with selected contractor
3.7) Issue by contractor of performance bond
3.8) Site preparation

95. Site preparation may include the following activities:

relocation of existing structure, pipes, cables, roads, etc.;
demolition and removal of structures and foundations;
wrecking;

grubbing;
site grading, cutting and filling to establish general job levels but not detail grading.
draining, removal of standing surface water, reclamation of swamps, etc.

3.9) Issue by entrepreneur of detailed drawings for foundations
3.10) Construction of foundations
3.11) Issue of detailed drawings for buildings and structures
3.12) Procurement of materials
3.13) Erection of buildings and structures.
3.14) Issue of detailed drawings for electrical work
3.15) Installation of electrical system
3.16) Cable installation
3.17) Unity connections from site to point of tie-in to public or private network
3.18) Issue of drawings for drainage
3.19) Drainage construction

4. Training

96. The on-site training should be carried out during the commissioning period

4.1) Preparation of training programme
4.2) Recruitment of staff
4.3) On-site training

5. Documentation

5.1) Submission by vendor of handbooks
5.2) Submission of drawings for maintenance purposes.

6. Criteria for contracting

97. If the project were less complex, then the number of engineering skills involved would be less numerous and so the list of activities would be considerably shorter. The entrepreneur usually faces one of his most important decisions in contracting for a project. Should he entrust the entire responsibility for engineering, equipment and supply and construction to one contractor, or should he divide the project into two or more contracts and accept responsibility for their co-ordination himself? The five criteria proposed to be used by the entrepreneur in deciding on subdivision of the project into separate contracts. They can be grouped broadly as follows:

Criteria that generally support on over-all contract	Criteria that generally support two or more contracts
	or his consulting engineer
Short completion period and earlier opportunity to earn revenue	Lower capital and operating costs
	Increased opportunity to use local resources and develop indigenous skills
Less demand on the entrepreneur's resources and correspondingly greater responsibility placed on the contractor.	To the extent to which it applies, lack of a suitably qualified and experienced main contractor

98. From the point of view of immediate economic efficiency, the conclusion for many projects would be to employ one main contractor which, in practice, almost invariably means an overseas firm. The entrepreneur minimizes his responsibilities, he obtains guarantees on time and performance, and any extra paid in capital costs would be more than offset by saving in time and the entrepreneur's administrative expenses or consultant's fees. However, in regard to the developing country as a whole, and the development of indigenous management and technical skills, as well as the entrepreneur's long-term interests, subdivision of the project into small, separate contracts, each carefully related to each other, would be more valuable eventually.

7) Use of local resources and development of indigenous skills

99. In African countries the use of local resources and development of indigenous skills predetermine the involvement of local firms into building and civil-engineering work not requiring the application of special techniques or the use of large quantities of heavy construction plant. Local contractors often lack in-depth management and financial resources; there is therefore, a practical limit to the size and complexity of the contracts which they can reasonably undertake. Considering all factors mentioned it is clear that it is only by subdividing the project that local contractors can be given the opportunity to participate fully. Examples of such subdivision are given below:

Small-scale plant for the production
of local building materials

Equipment supply	Overseas or local manufacturer
Equipment installation	Local contractor under or without supervision of overseas manufacturer
Civil-engineering and building work including site facilities	Local contractor
Plant commissioning	Overseas manufacturer assisted by local installation contractor or local installation contractor.
Project design, buildings and civil engineering design, project co-ordination	Entrepreneur through overseas or local consulting engineer

Subdividing the project does not necessarily achieve completion in the optimum time, or at the lowest cost; it also creates work for, and places considerable responsibility on the person co-ordinating the project, who is either the entrepreneur or his consulting engineer.

IV. OPERATIONAL ACTIVITIES

100. The problems of the operational phase need to be considered from a short- and a long-term viewpoint. The short-term view relates to the initial period after commencement of production when a number of problems may arise concerning such matters as the application of production techniques, operation of equipment or inadequate labour productivity as well as the lack of qualified staff and labour. Most of these problems should, however, be considered in relation to the implementation phase and necessary corrective measures should pertain principally to project implementation. The long-term view relates to production costs, on the one hand, and income from sales , on the other. In view of the above said, the small-scale entrepreneur should take an integrated view of the management of his plant for the production of local building materials. The small-scale entrepreneur has to be a manager since he cannot afford specialists to look after the multiple business decision regarding sales, finance, purchase and personnel. A new entrepreneur emerging from the ranks of employees and graduates usually possesses familiarity and experience in only one area, either production, sales or supervision. The overall managerial understanding is therefore should be developed in the business training.

101. Management is often defined as 'getting things done through people'. Entrepreneurs/managers want to achieve results or meet their objectives by initiating action and ensuring that this action is carried out by other people. The functions of management include planning, implementation and control. Each function

comprises some elements, which help entrepreneurs/managers to concentrate on the areas of appropriate activities. An illustration of management functions and their elements is given in Figure 5.

A. Planning

102. Entrepreneur/manager of small-scale building materials production unit is often occupied with the handling of day-to-day problems and he therefore believes that he simply cannot spare time for planning. He has often had only little training in planning and he feels unable to deal with uncertainties about the future. A small-scale entrepreneur or manager who develops his planning skills will become a more successful businessman. Planning is the management process that should precede any business activity. Strategic planning is concerned with the determination of the long-term objectives or strategies of business, whereas operational planning provides specific goals, procedures, schedules and budgets to fulfil the long-term objectives. Strategic planning sets the frame for future business and a series of operational plans prepares one for the implementation of a business strategy.

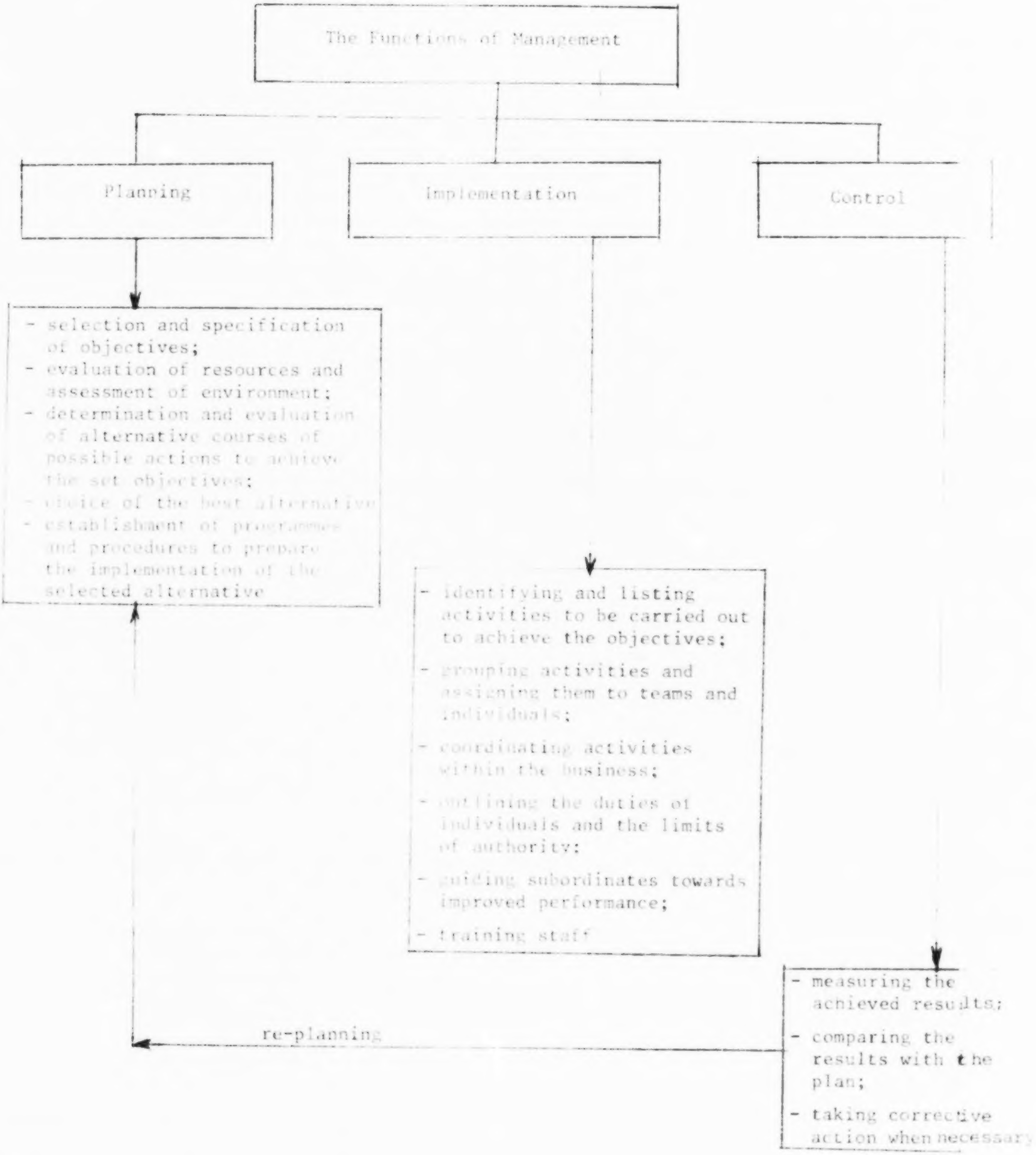
103. Once entrepreneur has defined the business in which the plant should be, a meaningful assessment of the environment and an appraisal of the internal resources should be made. The plant's relevant environment includes the following factors:

a) Demographic environment

As people make up markets for local building materials, it is important to know how the size and structure of the population will develop. In Kenya, for example, the population grows at a rate of almost 4% per year, and half of the population is younger than 15 years old. From only these two factors one can conclude a lot about the future markets for local building materials, and many more aspects of the demographic environment could be taken into account (e.g., changes of family size and of household size, movement from rural to urban areas).

b) Economic environment

Economic environment includes factors such as the general state of the business activity, growth of per capita income, availability of money, prices of building materials and supplies of raw materials (inflation), labour costs and availability, substitution of imports. Small-scale entrepreneurs/managers should try to identify these economic factors that affect their business. In particular, they should take into account the difficulties presented by the market for indigenous building materials (low levels of income of the population, who purchase these materials, Figure [illegible]. The Functions of Management



- selection and specification of objectives;
- evaluation of resources and assessment of environment;
- determination and evaluation of alternative courses of possible actions to achieve the set objectives;
- choice of the best alternative
- establishment of programmes and procedures to prepare the implementation of the selected alternative

- identifying and listing activities to be carried out to achieve the objectives;
- grouping activities and assigning them to teams and individuals;
- coordinating activities within the business;
- outlining the duties of individuals and the limits of authority;
- guiding subordinates towards improved performance;
- training staff

- measuring the achieved results;
- comparing the results with the plan;
- taking corrective action when necessary

for example), limited access to credit and/or foreign exchange resources required for production and building up of stocks.

c) Government factors

Government factors include taxes, rates, labour regulation, import restrictions, policy to restrict unfair competition and policy to promote trade and industry. Some of the factors are difficult to foresee by small-scale entrepreneurs/managers. However, because of their importance, an effort should be made to keep abreast of the changes in political opinion concerning business matters, especially vis-a-vis planning approaches and incentives for small-scale plants for building materials production. In those countries where a central machinery ensuring a comprehensive and co-ordinated approach to the planning and implementation of programmes for the development of building materials industry was established, entrepreneurs both prospective and established should keep in view the following provisions of a building materials development plan:

- the goals and targets for the short, medium and long-term periods;
- priorities for the development of specific building materials determined for each phase of the plan period;
- details for some projects on size of plant, product mix, location and technology, estimates of the number of new plants to be established in various geographical zones;
- target set and measures to be taken during the plan implementation to attract the participation of the private investor;
- the modalities for achieving higher capacity utilization rates in existing building materials plants, rehabilitation and upgrading programmes with the objective of increasing installed capacities;
- the implications of planned projects in terms of cost, technology, energy, infrastructure facilities, trained manpower, etc and the modalities for overcoming the consequences of these implications;
- the decentralization and diversification measures to ensure the timely availability of building materials for construction projects in all geographical zones of the country.

There are a number of factors which small-scale entrepreneurs/managers in both rural and urban building materials operations should consider in planning activity. These are the difficulties presented by the lack of information (for example, problems in gaining rights to the exploitation of geological small deposits) or constraints deriving from regulations and specifications (lengthy bureaucratic procedures for permits or licences; problems for the prevalent use of materials from the informal sector; lack of confidence for commercial-scale production; failure to provide any mechanisms for sustaining or improving the quality of building materials).

d) Technological environment

Because of the structural changes in the economy of African countries, small-scale entrepreneurs find that traditional manual technologies coexist with modern, advanced technologies. The selection of intermediate technology is a very complex decision and cannot be based on technical aspects only, but must consider market volumes, buying behaviour, finance, etc. In fact, the adoption of that technology faces the following common for African countries constraints:

- products are not competitive with large-scale products in terms of quality and variety;
- all the risks of producing a new building material or adopting a new technique fall upon the entrepreneurs;
- no guarantee that the building material will be accepted by clients;
- 'supply-and-fix' arrangements are required for the use of new building materials to meet customer needs;
- lack of accepted building materials standards;
- lack of simple and agreed methods of quality control and inspection to give a guarantee of adequate performance in use.

e) Natural environment

Natural environment factors concern mainly the availability of raw materials, increased cost of energy and the level of pollution. Environment changes can be either an opportunity or a threat to a business, and so small business management should classify the environmental factors accordingly.

104. In the next step the internal resources of the entrepreneur relevant to the changes of the environment should therefore be appraised after the environment has been assessed. The principal factors for most small-scale production units include:

personnel and organization (capability of staff, labour relations, efficiency of organisation);

marketing (relationship to customers, quality of product lines, market know-how);

finance (adequacy of funds, appropriate capital structure, availability of financial reserves);

production (suitable machinery, sufficient capacity, production efficiency).

105. Based upon an appraisal of internal and external business conditions, small-scale entrepreneur/manager can now determine the appropriate strategy for the plant. The strategy of a small-scale production unit is reflected in its long-term objectives, its policy, organisation and investment. The long-term objectives usually include goals for sales revenue, profitability and market shares. All objectives should be specific, measurable, attainable and consistent. Some small-scale entrepreneurs/managers define the long-term objectives rather vaguely, because they believe that uncertainties in the future do not allow for a more precise definition. The policy of the entrepreneur sets up boundaries within which the plant must work and within which the management can make decisions. Policies deal with business ethics, employee relationships, supplier relationships, product development, machinery, ownership of the plant. Long-term objectives and policies supplement each other, as the objectives tell entrepreneur what should be achieved, whereas policies give entrepreneur/manager a basic idea how the objectives should be achieved.

106. Strategic planning always concerns the business as a whole, whereas operational planning can be subdivided into different fields of planning such as production, marketing and finance. It is common practice in operational planning first to determine these plans individually and to reconcile them in a second planning stage. Operational planning starts with the identification and specification of the operational objectives for each planning field. Operational objectives are usually for a period not longer than one year and they should be more detailed and specific than the long-term objectives. The marketing plan comprises short-term marketing mix and cover all activities related to sales promotion, advertising, product lines, pricing, distribution and sales force management. If the operational planning requires more and better market information management has to plan for more market research. The operational production plan should include the planning of the production programme (what will be manufactured), the production process (how it is produced), the production schedule (when it is manufactured), the purchasing and storage of materials, quality control, training and supervision of labour, service and maintenance of machinery and product development. The administration plan covers general personnel matters, control of overheads, accounting and auditing, and general organization. The financial planning results in a budget and in a cash flow forecast. The operational budget is a projected profit and loss account for the period of the operational planning. The cash flow forecast shows the availability of cash during the same period, whereby the total period is usually subdivided into 5 to 12 shorter periods.

107. When all plans are competed, they have to be revised in such a way that they are feasible with the company's limitations and resources. Operational plans take the form of procedures, schedules or budgets. Procedures are standing plans for activities that follow the same sequence. They establish the manner and sequence in which certain activities must be carried out. Schedules are commonly used for timing series of activities. Budgets are financial plans for future action. They also provide standards against which progress or accomplishment is measured.

1) Practical strategic planning

108. Managers of many small businesses believe that it is more worthwhile to concentrate on finding solutions to daily problems. They do not realise that some of those daily problems would not have come up if the company had had a proper strategy. Strategic planning does not have to be sophisticated. It is simple. Strategic planning is basically about two questions.

- What threats or opportunities will there be in the future?
- What can be done about them?

The answers to these questions lead to the strategy of a company. Every strategy should be worked out as specifically as a possible and should give answers at least to the following questions:

What should be done?
How much does it cost?
What are the most likely results?
When should it be done?
Can the strategy be implemented with the existing internal resources?
Are there other resources available?

109. Strategies should also consider the strengths and the weaknesses of the company.

There are basically only three different strategies:

- to maintain the present level of operation;
- to increase the present level of operation;
- to reduce the present level of operation.

2) Practical operation planning

111. The following step-by-step approach to operational planning is practical and could be used by many small-scale entrepreneurs in running of their business.

Step 1: Specify the operational objectives.

Step 2: Decide on the number of building materials units you want to sell.

Operational planning should always begin with that plan that restricts other plans. As marketing in small-scale production of local building materials is a bottleneck, it is suggested to begin with the marketing plan. First, a sales target should be set that is realistic and attainable. It should also be consistent with the long-term objectives (i.e., to achieve certain market shares).

Step 3: Determine the optimal marketing mix that is required to achieve a sales target. There are different instruments (i.e., sales promotion, pricing, advertising, distribution and selling) that can be used in marketing. A combination of them is called a marketing mix. After the sales target is set, entrepreneur now has to work out how these marketing instruments should be applied in order to achieve its target. The expected results and expenses should be clearly specified as well as conditions under which they are expected.

Step 4: Determine the material requirements and decide on the quantity to be purchased and stored.

Material requirements follow from the production programme and the volume of components that will be bought. The production programme corresponds to the sale programme (or sales target) if there is no variation of the stocks of produced building materials. Otherwise, the production programme has to be adjusted accordingly. The material requirements are then compared with the existing stock of material in order to determine the quality and quantity of material to be purchased. The actual order of quantities will depend on many factors, such as costs of ordering and storage, funds available and storage capacity.

Step 5: Determine the labour requirements and decide on the procurement of staff.

The labour and staff requirements follow the production and marketing plan. This applies in particular when skilled workers are not available in the short run.

Step 6: Budget overheads

It is useful to look at the last budget and to find answers to the following questions:

Will the overheads be higher in future due to non-controllable reasons (i.e., price increases)?

Can overheads be reduced by introducing new procedures and more economical uses of resources?

Are overheads sufficiently related to the level of operations?

Some overheads have previously been determined by the marketing and production plan; others have to be budgeted now.

Step 7: Prepare the operating budget and check the profitability.

If steps 1 to 6 have been properly taken, it should be quite easy to prepare an overall budget. If profitability does not meet expectations, the operational plans have to be revised.

Step 8: Prepare the cash flow forecast and check liquidity

If there is not enough cash to carry out the operational plan, entrepreneur has basically three options:

rearrange the figures of the cash flow by changing assumptions about the time of payment.

- look for short-term finance;
- revise the operations plan.

112. All operational plans are interlinked with each other and it is therefore necessary to coordinate the plans at every stage of planning. If necessary, plans that have already been decided upon at an earlier stage have to be revised in order to achieve the overall objectives.

B. Book-keeping

113. Good documentation has to be thought about and planned by the entrepreneur to suit his own special needs. So he should plan his system of documentation to fit in with his needs as a manager of resources. The four main resources which he has at his command are:

Labour
Materials
Plant and transport
Finance

The way in which all these resources are used will determine whether or mot his business is efficient and profitable, and the use of each will have to be checked regularly to ensure that no wastage occurs.

1) Labour records

114. The basic labour record is the time sheet, which shows the number of hours worked by each man or a particular operation and is usually filled in every day by the entrepreneur or his manager. Where more detail is required, a daily labour allocation sheet can be used. The examples are shown below:

	Job No...	Week ending:							
	Name	M	T	W	T	F	S	Sn	Total
1									
2									
3									
4									
5									
6									
	Total								

A TIME SHEET

TYPICAL DAILY LABOUR ALLOCATION SHEET

DAILY LABOUR ALLOCATION

Job No. Address

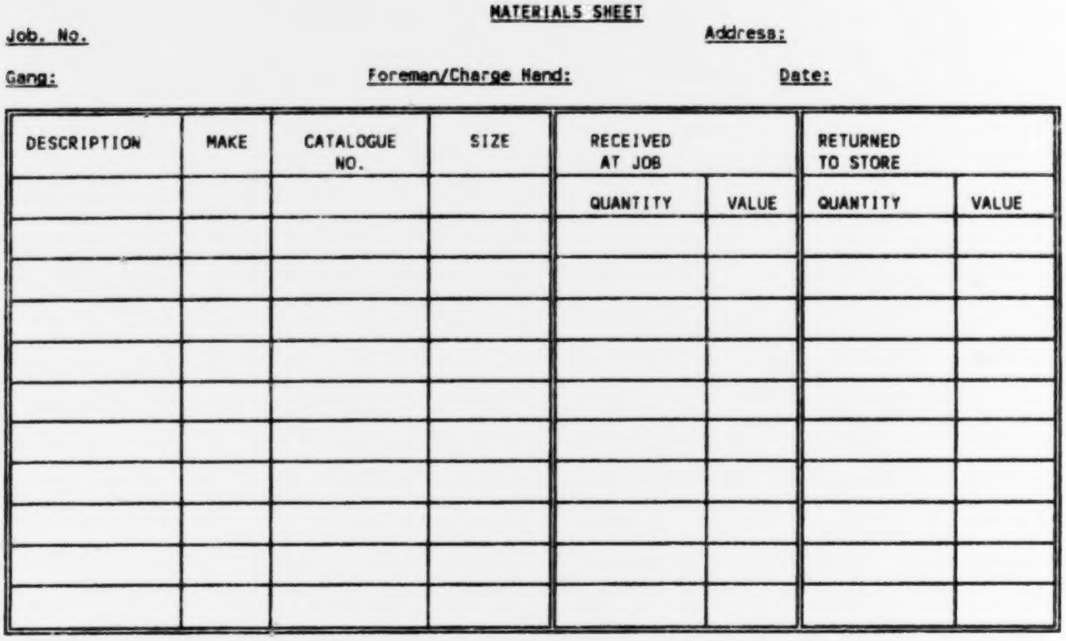
Gang: Foreman/Charge Hand: Date:

Task										Total hours per man
Name	No.									
Hours per task										

2) Materials records

115. Once the materials have been delivered, the entrepreneur will need to keep track of how they are used. A form which will help with this is the materials sheet, illustrated below.

TYPICAL MATERIALS SHEET



MATERIALS SHEET

Job. No. **Address:**

Gang: **Foreman/Charge Hand:** **Date:**

DESCRIPTION	MAKE	CATALOGUE NO.	SIZE	RECEIVED AT JOB		RETURNED TO STORE	
				QUANTITY	VALUE	QUANTITY	VALUE

3) Plant and transport

116. Although it is difficult to prescribe exactly which forms will have to be used by every entrepreneur, it can be said that sufficient information must be gather to calculate costs accurately under the following headings:

- Operators' wages;
- Fuel and oil;
- Servicing and maintenance;
- Major repairs;
- Taxation and licensing;
- Insurance;
- Depreciation.

Where mechanical plant or vehicles are employed, regular maintenance must be carried out in accordance with the manufacturer's instructions. Thus it is important to set up some form of system to check regularly on which items are due for maintenance. In a small firm this can be a simple checklist showing speedometer readings or dates at which servicing is due, against which the entrepreneur or his manager can check when this must be done.

C) Financial accounting

117. The entrepreneur must devise an accounting and documentation system that controls both cash and credit transactions, and enable the entrepreneur to assess his assets liabilities regularly to avoid any danger of insolvency.

1) The accounts

118. An accounting system should be set up to know whether the income is equal the expenditure, or to know where the money has come from or gone to. An accounting system is a set of rules for keeping track of income and expenditure. Here is an example of a simple accounting system:

- A cash book
- A bank book
- A record of donors
- A working balance sheet
- A profit and loss account

The simplest accounting requires two books, one for cash and the other for the bank if the entrepreneur has opened an account.

a) The cash book

119. The cash book and the bankbook are kept in the following way:

CASH BOOK FOR PROJECT

Date	Number of the item	Payments out	Payments in	Balance
1985				
3 July Cash balance	1		125	125
5 July Transfer from bank	2		1000	1125
8 July June wages of J.Bita	3	225		900
10 July Stamps bought	4	20		880
15 July Boxes for nails	5	5		875
16 July Petrol for transport	6	13		862

b) Balance sheets

120. The entrepreneurs are required by law to have this 'count up' the least once a year, and provide a balance sheet and profit and loss account audited by an independent accountant. In fact most business need to provide this sort of information annually for taxation purposes, and it will also be necessary if there is any intention of seeking a loan from the bank or perhaps even if extended credit is to be sought from a supplier.

The balance sheet is not merely another account, although it is prepared from the figures shown in the account books of a business. The balance sheet is in fact a statement of the financial standing of a business as reflected by its:

Assets	Liabilities	Owners' capital
The assets could be seen as the financial resources of the business. Total assets include both fixed assets (such as buildings, plant and vehicles) and current assets (such as stock, debtors, cash, etc.). Current assets change from day to day. Fixed assets also change, but more rarely as they depreciate, are sold or supplemented by new purchases.	The liabilities represent the obligations of the firm to pay money to outsiders for various purpose. Some of these liabilities may be long term if a debenture or loan has been raised which will not have to be repaid for several years. Other liabilities are current including creditors, current taxation, wages and salaries, etc.	If assets do exceed liabilities, the difference between the two belongs to the owners of the firm and called 'owners' capital'. This will consist of the money that the owners put into the business in the first place, together with other funds or reserves that have been left over from profits earned over the years but not taken out in the form of dividends or drawings.

121. The most common way of drawing up a balance sheet is to show owners' capital and liabilities on the left and assets on the right. Since owners' capital is the difference between assets and liabilities, the totals on the left and the right should 'balance' or be exactly the same. A typical balance sheet shown in the following illustration:

Typical Balance Sheet
As at 31st March 1978

		$			$	
Owners' Capital			Fixed Assets			
Issued capital ($1 ordinary shares)		10,000	Land and buildings (at cost 1972)		6,800	
Balance on profit and loss account		19,700	Plant and machinery	8,100		
			Less Depreciation	5,200	2,900	9,700
		29,700				
Current Liabilities			Current Assets			
Creditors	2,300		Work in progress		7,500	
Taxation	600	2,900	Debtors		5,000	
			Cash at bank/ in hand		4,000	
			Investments (market/ value $10,000)		6,400	22,900
		32,600				32,600

c) Profit and loss accounts

122. To know whether or not the business is making a profit the entrepreneur needs a current profit and loss account which gives a measure of the present financial efficiency of the firm. Unlike the balance sheet, which is a statement of the state of a business on a particular date, the profit and loss account covers a period. It is usual for the profit and loss account to cover a complete trading year, but it always runs from the date of one balance sheet to the next since balance sheets and profit and loss accounts depend on each other. A profit and loss account shows for particular period of time either: the surplus of income over costs which represent the amount by which the original capital has increased; or the loss, representing a reduction of the original capital. If a profit has been made, the profit and loss account will also show how much has been taken out of the business as dividends or drawings and how much has been left to boost working capital to allow additional business to be financed. A typical profit and loss account contains the following information:

TYPICAL PROFIT AND LOSS ACCOUNT

Profit and Loss Account for the Year Ending 31st December 1978

Sales and Work Done		52,500
Investment Income		640
Total		53,140
Wages and Salaries	10,000	
Materials	20,800	
Sub Contractors	4,020	
Plant & Vehicle Expenses	2,850	
Bank charges	400	
General Insurance	850	
Postage and Telephone	320	
Printing and Stationery	180	
Casual Labour	520	
Depreciation	1,400	41,340
NET TRADING PROFIT		11,800

d) Profit and loss appropriation account

123. The profit and loss account tells the reader how much profit (or loss) entrepreneur has made. He still needs to know what happened to the profit. How much the Government take in taxation? How much did the entrepreneur or shareholders decide to take out in dividends? What was left to put back into business to finance increased business in future? To find the answers to these questions the entrepreneur should turn to the Profit and loss Appropriation Account, which is a subsidiary account to the profit and loss account.

TYPICAL PROFIT AND LOSS APPROPRIATION ACCOUNT

	$
Balance b/fd.	13,960
Add Net Trading Profit	11,800
	25,760
Deduct Taxation	4,860
	20,900
Deduct Dividends	1,200
Balance c/d	19,700

2) Cash-flow forecast

(a) What is a cash-flow forecast

124. The cash-flow forecast is a projection of how the cash book will look like in the future. After a cash-flow forecast has been prepared, the future cash position or liquidity will be known as will the timing of any future cash shortages. With this information, the steps necessary to overcome future liquidity problems can be taken. The cash-flow forecast is the tool which enables the entrepreneur to recognise future cash deficits and take the appropriate action. But the main reason for preparing a cash-flow forecast is cash control. It is extremely difficult to manage a plant successfully without proper control of the cash flow. In order to know how much can be spent on each expense item, it is essential to know how much can be expected from debtors and when. In addition, a cash-flow forecast enables the entrepreneur to determine what proportion of the profits can be withdrawn from the business by way of dividends and/or drawings.

(b) The structure of a cash-flow forecast

125. The structure of a cash-flow forecast has four parts:

- the opening cash balance;
- the cash flowing into the business;
- the cash flowing out of the business;
- the closing cash balance.

126. The opening balance includes all cash in hand or at the bank at the commencement of the specified period of time of the forecast. The cash inflow shows how much cash will be coming in during the period and the cash outflow the cash going out during the period. If the cash inflow is added to the opening balance and the cash outflow deducted, the result will be the closing balance. That closing balance will then be the opening balance of the following period. The opening balance on a cash-flow forecast will be one figure and so will the closing balance. But the cash inflow and cash outflow will be more detailed and may consist of several or many items. The number and definition of the items included in the inflow and outflow will depend on the reason for the forecast. The periods to be considered in a cash-flow forecast need be only short if great accuracy is required and could be long if only a rough forecast is needed. The number of periods will depend on the length of the total period required to be covered.

c) How to prepare a cash-flow forecast

127. The opening cash balance will be obtained from the cash book and bank account as long as the cash-flow forecast commences from

the present. If the beginning of the first period is sometime in the future, the opening balance will have to be forecast. The figure for cash inflow may consist of any or all of the following items:

- cash sales;
- collection from trade debtors;
- collection from other debtors;
- sales of fixed assets.

Cash outflow may include all or any of the following items:

- expenditure on current operating expenses;
- payments to trade creditors;
- repayments to trade creditors;
- repayment of loans;
- payment of dividends/drawings.

128. The expenditure on current operating expenses corresponds to expense items in the profit and loss account but the amounts will not be the same because the profit and loss account includes amounts payable as well as paid. In a cash flow forecast only the actual expected payments will be considered and not the actual charge against profits. This principle applies to all cash outflow items such as raw materials, electricity, interest, telephone, water, rent, etc. The difference between cash inflow and cash outflow is the cash surplus or deficit for the period and it indicates by which amount the opening balance increases or decreases. The computation of the closing balance is purely an arithmetical exercise:

	Opening Balance
add	Cash Inflow
less	Cash Outflow
equals	Closing Balance ===============

129. If the projected closing balance is negative, either

- a bank overdraft will have to be arranged, or
- the cash inflow must be increased, or
- the cash outflow will have to be decreased by cutting down operating expenses for example.

130. When the projected closing balance is compared with the actual closing balance, there will probably be a variance. From this variance analysis, it can be learned what went wrong in the past and the ability to prepare better cash flow forecasts will

improve. An example of a cash-flow forecast is given in Annex VIII which shows a cash-flow analysis for a proposed lime factory in Ghana.

3) **Making monthly budgets**

131. A budget should be worked out at the outset for a period of a year on the basis of the timetable. But a whole year is too long a period for keeping proper track of the money side of a project. For the current year the budget must be divided up into months to compare with the timetable. To keep a better control over monthly expenses and to make sure that the project is progressing as planned, it is helpful to draw up a set of monthly budgets like in Figure 6 and then add up each item (row) for every month to get the yearly total. The timetable of expected income and expenditure of the project is given in Figure 7.

(a) Control of the monthly budget

132. To know if the entrepreneur's monthly expenses are what he expected, he should check them each month. The following table may be useful as an example.

Table 8 Control of the monthly budget
January 199

	The month's expenditure shown in the budget	The month's actual expenditure	Difference
Land rent	-	-	-
Explosives for blasting	2000	1800	- 200
Tax on above	-	-	-
Hiring charges for tractor and scraper	200	210	+ 10
Fuel for kiln	800	800	-
Bags for lime	800	850	+ 50
Provision of utilities	400	400	-
Kiln repair	-	-	-
Wages	1600	1500	- 100
Social security payments	200	190	10
	6000	5750	- 250

133. Any difference between the budget and actual expenditure must be explained, so that the entrepreneur can decide whether he should increase his budget for the rest of the year or change the project (including the timetable) so that expenditure remains within what

the project can afford. In this example 250 less than the amount shown in the budget has been spent. The entrepreneur should do the same with income and compare the expenditure and income each month to identify how they balance.

(b) Control by the monthly cumulative totals

134. If, from January onwards, a total is made for the expenses and income since the beginning of the year it is possible to compare the actual results with the budget figures even more easily. In this case the table looks like this:

Table 9 Cumulative expenditure and income month by month

Expenses	Budget from 1.1.91 to 31.5.1991	Expenditure from 1.1.91 to 31.5.1991	Difference
Wages	8000	8120	+ 120
Bags for lime	4000	4250	+ 250
etc. (follow the details in Figure 6)			

igure 6. Monthly budget of small-scale hydrated lime manufacturing plant in Ghana

Curency in ¢

xpenditure	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Total
and rent	-	-	-	-	-	-	-	-	-	-	-	1000	1000
xplosives for blasting	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	24000
ax on above	-	-	-	-	-	-	-	-	-	-	-	2400	2400
iring charges for ractor and scraper	200	200	200	200	200	200	200	200	200	200	200	200	2400
uel for kiln	800	800	800	800	800	800	800	800	800	800	800	800	9600
ags for lime	800	800	800	800	800	800	800	800	800	800	800	800	9600
rovision of utilities water, lighting)	400	400	400	400	400	400	400	400	400	400	400	400	4800
iln repair	-	-	-	-	-	-	-	-	400	-	-	-	400
ages	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	19200
ocial security payments	200	200	200	200	200	200	200	200	200	200	2400		
onthly total	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	9400	
umulative total	6000	12000	18000	24000	30000	36000	42000	48000	54400	60400	66400	75800	75800
ncome													
ales of lime	7700	7700	7700	7700	7700	7700	7700	7700	7700	7700	7700	7700	92400
ocal support from ublic Works Dept.	10000	-	-	-	-	10000	-	-	-	-	-	-	20000
onthly total	17700	7700	7700	7700	7700	17700	7700	7700	7700	7700	7700	7700	112400
umulative monthly total	17700	25400	33100	40800	48500	66200	73900	81600	89300	97000	104700	112400	

Figure 7 - Comparison of income and expenses

Month	Cumulative amount of monthly expenditure	Cumulative amount of expected income
January	6000	17700
February	12000	25400
March	18000	33100
April	24000	40800
May	30000	48500
June	36000	66200
July	42000	73900
August	48000	81600
September	54400	89300
October	60400	97000
November	66400	104700
December	75800	112400

Note: The cumulative amount of monthly expenses is the same as the bottom line of example Figure 6 (expenditure). The cumulative amount of expected income is the same as the line 'cumulative monthly total' of Figure 6 (income).

From the example above, Figure 7, it is evident that with the timetable of expected income and expenditure the projects quite profitable.

D. Organizational structure

135. The size of the enterprise, the grouping of its units within the production process and their organizational attachment as well as the number, size and organizational set-up of service, administrative and sales teams depend largely on the capacity and the engineering to attain the established production programme. When dealing with the organizational arrangements for a small-scale building materials project, attention should be paid to the planning of overhead costs related to the operations of the enterprise, the administration and the sales and distribution service. The entrepreneur should obtain a good understanding of the types of operations and services needed to achieve the production objective. In a small enterprise the amount of time and effort required to administration and sales should be related to the entrepreneur's activities. In this case overhead costs could be reduced and, hence, all expenses related to administration, sales and distribution should be avoided and the accumulation of funds at the expense of overheads could be used for operational activities.

E. Industrial relations

136. The entrepreneur represents the manufacturing and supplier sector among the sectors involved in the construction process. Providing building materials and components for the construction process, he should collaborate and co-operate with other sectors, which provide inputs to his operations, and thus exert a considerable influence on the entrepreneur's activities. The manufacturing and supplier sector is shown in Figure 8, which presents the typical participants in construction. The lack of collaboration and co-operation of the entrepreneur with any of the participant in the construction process directly or indirectly affects the production of building materials. The building designers, who are responsible for the technical choices which are made, the planners, who decide which factories to build, the distributors who make materials available to sites, the builders who have to take responsibility for construction and the users as well all have an influence on the entrepreneur's activities. Design and research sectors, for example, have a vital role to play in the promotion of new building materials suitable for local conditions. Research on the properties and performance of the materials is only one of their roles; in order to get their new ideas beyond the laboratory and into a highly conservative construction industry, they need to carry out vigorous promotion programmes. They must actively seek for entrepreneurs and builders to apply their research by advertising opportunities, issuing simplified technical literature, and running training programmes, etc.; and they must be involved in setting up standards committees bringing together researchers, suppliers, users and government organizations to lay down performance requirements. Some institutes have also set up networks of local building centres which can house displays of materials and act as advice centres for entrepreneurs, builders and designers on choice of techniques and materials. Among such kind of institutes which have been long established are the Building and Research Institute at Kumasi in Ghana, the Building Research Unit at Dar-es-Salaam in Tanzania, the Building Research Institute at Khartoum in Sudan. Many African universities have also been active in this field.

137. The work of promoting small-scale units for the production of local building material cannot be left entirely to Building Research and Design Institutes. In some countries the creation of these units is left entirely to the free market, and to entrepreneurially-active societies. In other countries, national or local government agencies have developed special organizations or programmes for the promotion of small-scale industry. The activities of such organizations include: supply of drawings, designs and financial data to prospective entrepreneurs; technical guidance and supervision during establishment of new small-scale units; running training programmes for skilled workers; preparation of simplified technical literature; supervision of plant

manufacture and organization of technical seminars and meetings. But, of course, the success of any small-scale building materials plant depends primarily on its own efficient management, and no amount of government support can make up for deficiencies in this area.

Figure 8 - Typical participants in construction

CONSTRUCTION INDUSTRY

Client sector

Owner
Promoter/initiator
Developer
User

Construction sector

General contractor
Specialty contractor
Craftsmen
Labourers
Unions

Design sector

Architect
Engineer
Consultant
Professional associations

CRITICAL CONTRIBUTORS

Financial sector

Lender
Investor
Insurer

Manufacturing and supplier sector

Raw materials producer
Product and component manufacturers
Distributors
Trade associations

Regulatory sector

Regulatory agency
Code bodies
Standards organization

Information and education sector

Publications
Universities
Vocational schools

Research and development sector

Research centres
Testing laboratories
Inventors

F. Personnel management

138. Personnel management is the planning, implementing and controlling of all measures that concern personnel. These measures include the procurement, training and motivation of and compensation for personnel. The procurement function of personnel management is concerned with the obtaining of the right kind and number of personnel for the company. In a small enterprise, personnel management is mainly the responsibility of the entrepreneur or his manager. Functions such as training can be carried out by his subordinates. However, the basic principles of personnel management are the same in both small and large companies. Management of small-scale building materials plants should try to design the plant's jobs in such a way that a high level of job satisfaction can be achieved. Excessive specialization of workers as well as concentration on technical efficiency rather than on staff needs should be avoided as much as possible. For that purpose, jobs can be enlarged or enriched.

139. The total workload describes the kind and number of jobs that have to be done in a given period. It will tell how many pieces of a product are to be produced, how many times a certain production step has to be done. In order to find out how many production workers or other staff members will be required, the total workload of every job type has to be divided by the achievable workload per employee.

1) Training personnel

140. There are different types of training programmes:

(a) General orientation or induction training

141. There is a special training for new employees. It gives the employee a 'feel' and overview of the enterprise and where his job fits in.

(b) On-the-job-training

142. Some jobs are better learned and expertise acquired while actually performing the job. An experienced worker, foreman or supervisor instructs the trainee about the 'ins' and 'outs' of the job and the trainee learns by doing. The success of this training methods depends on the teaching qualities of the trainer.

(c) Special training courses

143. Such courses may cover new production methods, information about new legislation, export marketing, etc.

144. The timing of training programmes is of crucial importance since persons should be sufficiently trained to be able to take up their positions as and when they are required. Thus, personnel at various levels should already have undergone any training necessary before production starts, during the preproduction and construction stages. The requirements of training for various levels of plant personnel, the duration of such training for each category, and the location of and arrangements for training should be defined. Workers are given theoretical training covering fundamental principle of different operations for the production of building materials, types of machine and tools, knowledge of raw materials used for the production of low cost building materials and practical training in the skills required. Foremen are given practical and theoretical training covering the respective operations and processes, the materials used, inspection and testing, reading of blueprints, design and manufacture of simple tools and components of machines.

2) Motivation

145. Making work more worthwhile is the challenge of every manager. Motivation is what makes a person do something. It makes him put energy and effort into what he does. Attitudes and behaviour at work reflect motivation or lack of it. Indications of motivation will be seen in, for example:

- high performance/results achieved
- energy, determination and enthusiasm
- co-operation in overcoming problems
- willingness to accept responsibility/accommodate change

Lack of motivation will be indicated by:

- poor time-keeping, excuses for idleness, absenteeism
- exaggeration of grievances, disputes
- unco-operativeness, resistance to change
- gossiping and wandering from place to place during work
- unfinished or untidy work

146. The main motivators that are available to the management of small enterprises including the following: pay, security of job, an interesting job, competent and fair management, recognition of work done, good working conditions.

3) Labour legislation

147. Personnel management must always make sure that relevant labour legislation is adhered to. In Kenya, for example, this legislation governs employment matters, such as dismissal, wages and industrial disputes. The Kenya labour legislation includes:

The Employment Act of 1976 (Chapter 226)

The objectives of the revised act (the original act dates from 1938) are:

- to consolidate, with amendments, the laws relating to employment and related matters

- to give clear explanations when employing a worker about accepted paying methods and to indicate the steps in the dismissal process

- to define matters relating to work, such as annual leave, benefits, etc.

The Factories Act of 1951 (Chapter 514)

Its purposes are:

- to make provisions for the health, safety and welfare of persons employed in factories and other places

- to provide for registration of factories and provision of facilities to workers

- to provide for protective measures against dangers in factories

Regulation of Wages and Conditions of Employment Act (1951) (Chapter 2299)

The major objectives of this act were:

- to provide for the establishment of wage advisory boards and wage councils for the regulation of remuneration and conditions of employment and for other related matters

- to provide for the establishment of wages boards and agricultural wages committees to deal with employee wages and conditions of work in the area of agriculture

- to regulate wages in the non-armed forces sector

Industrial Training Act of 1960 (Chapter 237)

Its purposes are:

- to make provisions for the regulation of training of persons engaged in industry

- to give procedures to follow in apprenticeship contracts and to define rights and duties

- to define steps or procedures to be followed in terminating apprenticeship contracts

Workmen's Compensation Act of 1949 (Chapter 236)

The aims of this act were:

- to provide workmen with compensation for injuries incurred in the course of their employment

- to specify the groups of people that are covered under this act

Industrial Relations (Chapter of 1962)

This charter was signed by KFE, KFL and the government. Its objectives were:

- to define the obligations of management and unions in industrial relations

- to define a recognition agreement to guide unions and management

- to establish a joint disputes commission

- to define redundancy, employment policy, strikes, lockouts, etc.

Trade Dispute Act of 1971

This act is a revision of the acts of 1964 and 1965. Its main purpose was to establish the industrial court and to create machinery to settle disputes in case of conflicts between management and unions.

G. Legal aspects of management

147. Before a small-scale entrepreneur can engage himself in the production of local building materials, he has to register his business so that it is recognised by the law. The business can be registered under his name; it can be a partnership or even a limited liability company. The legal form of a business constitutes the frame in which it can be conducted and it is therefore very important for every entrepreneur to know the legal implications of choosing a certain legal form. To obtain registration of a company certain documents must be filed with the

application. For example, some government institutions and ministries require the following information:

- The location and area of occurrence of raw materials deposits and the extent of proven deposits available for the project.
- Chemical analysis report on the raw material.
- Type of fuel to be used, its source of supply, its approximate distance from the building materials plant and the proposed mode of transport.
- Brief description of the process and technology to be adopted.

148. The entrepreneurs should have to complete the registration under Companies Act or under the Societies Act if a society, or under other laws existing in the country. Other government regulations include permissions, clearances, licences, taxes and incentives. In Kenya, for example, trade licensing is regulated by the Trade Licensing act. No person may conduct any business in Kenya except under and in accordance with the terms of a current trade licence. The entrepreneurs should be provided with a working knowledge of the Sales Tax Act, because small-scale manufacturers can be collectors or potential collectors of sales tax on behalf of the government. The entrepreneurs who are registered under the Sales Tax Act in some countries can claim refund of the sales tax they paid on raw materials. This will reduce their raw material cost and consequently they will be more competitive.

H. Marketing

149. Marketing means to keep in close contact with your customers and their needs. It seeks profit through the identification of consumer wants, and having found these wants, it produces products that give consumer satisfaction at a profit.

150. Market research is designed to reduce as far as possible the risk element which is inherent in any commercial venture. It is also used to confirm or deny the views and opinions held by the entrepreneur about the building material he is selling. In general terms, market research can be defined as the systematic gathering recording and analyzing of data about problems relating to the marketing of goods. The services of a market research agency can be very useful but also rather expensive. A small-scale entrepreneur therefore should weigh the advantages and disadvantages of employing agencies.

151. The small-scale entrepreneur himself has little time to devote to the specialized function of marketing and sales promotion. The diseconomies of small size could be overcome in this field through joint action by groups of local building materials manufacturers or building industry associations and through the co-operation of entrepreneurs. Nevertheless, to be successful, the small-scale entrepreneur should be well acquired with the knowledge of market analysis, sales forecasting, profit planning and budgeting, marketing organizational planning, and advertising and merchandising. The scope of knowledge in each area depends on the size and complexity of the project. Achieving optimal sales and revenue is only possible if activities reflect shifts in market demand. As the tastes of users and consumers change, the marketing strategy must incorporate these changes and provide the entrepreneur with alternative ways to deal with them.

V. CONCLUSIONS

152. Entrepreneurs in the small-scale production sector require training in three broad areas: starting up the venture, production techniques and personnel and financial management. The following considerations should guide the preparation and organization of training for entrepreneurs:

- Training should be viewed as a continuing process until such time that the entrepreneur becomes fully conversant with all the basic skills required and is able to put his business on a sound financial footing, assuming that problems regarding production inputs, particularly capital and raw materials, are brought under control. Training needs of individual entrepreneurs should therefore be evaluated periodically and planned for;

- Training courses should focus on imparting practical skills which would be of immediate utility to the entrepreneurs. The use of workshops as a training medium should therefore be emphasized. Demonstration training centres where entrepreneurs are given opportunities to acquire on-the-job skill in materials production methods have been used with a high degree of success in some countries. In many African countries, research and design institutes are playing the lead role in the development of appropriate production technologies for local building materials. Their facilities and expertise can be drawn upon in the organization of training for entrepreneurs;

- Manuals on the production and utilization of the various building materials whose development is being promoted in the country should be prepared for use by entrepreneurs. The production manual should stress raw materials selection and preparation, the correct production processes and quality control procedures, as well as simple field tests for raw materials and finished products;

- The organization responsible for the development of small-scale building materials enterprises should develop a strong training unit with qualified personnel. The unit should identify and involve, in its activities, existing national institutions with facilities for providing training in any of the areas identified as necessary for building up the competence of entrepreneurs.

153. The Economic Commission for Africa (ECA) as the executing agency of the programme for the development of building materials industries in Africa should identify in collaboration with relevant international agencies institutions in the region to prepare training programmes in management techniques and marketing for small-scale industries. These regional training manuals will be adapted locally by national R & D institutions in collaboration with other relevant organizations.

Definition of Production Criteria and Grades

Production criterion	Grade A	Grade B	Grade C
1. Raw materials source The optimum distance from source to factory...................	less than 8 km	8 - 160 km	more than 160 km
2. Water requirement The volume of water consumed to manufacture $2,400 of product	more than 13,500 litres	4,500 - 13,500 litres	less than 4,500 litres
3. Fuel costs The total fuel costs as a percentage of production costs	more than 10	5 - 10	less than 5
4. Electricity requirement Electricity costa as a percentage of fuel costs......................	more than 90	50-90	less than 50
5. Minimum size of market The minimum value of annual output that would justify capital costs (thousands of $)....................	more than 1,200	240-1,200	less than 240
6. Capital for storage Outlay on storage facilities at all stages of manufacture expressed as a percentage of capital costs.............. ...	more than 15	5-15	less than 5
7. Reliability of process The length of time the basic process has been used commercially........................	less than 10 years	10-30 years	mroe than 30 years
8. Adjustability of proces How easily the process can be adjusted to market demand	continuous process	intermittent but regular	adjustable to demand
9. Plant maintenance The percentage of production time lost through maintenance.......	10	5	nil
10. Supervision/quality control The ratio of supervisors to total labour force and proportion of their time spent on supervisory duties	10% continuous	5% continuous	only intermittent supervision
11. Skilled labour The ratio of fully skilled operative to the total labour force........................	more than 50%	10%-50%	less than 10%

12.	Production per man-hour The value of product per man-hour worked......................	less than $4	$4-$10	more than $10
13.	Packaging The percentage of costa added for packaging.......................	10	5	nil
14.	Value/weight ratio The sale value per ton of product	less than $30	$30-$150	more than $150
15.	Handling for delivery The equipment requried for loading and unloading transport vehicles..................	Cranes	hoists, lifts etc.	no equipment
16.	Cost of delivery The addition to works costs for delivery cost....................	more than 10% in 50 mile radius	5%-10% any distance	less than 5% any distance

CLASSIFIED BUILDING MATERIALS GRADED ACCORDING TO SELECTED PRODUCTION CRITERIA

Materials Production criteria	*Raw materials source*	*Water requirement*	*Fuel costs*	*Electricity requirement*	*Minimum market size*	*Capital for storage*	*Age of process*	*Continuity of process*	*Plant maintenance*	*Supervision and quality control*	*Skilled labour*	*Production per man-hour*	*Packaging*	*Value/weight ratio*	*Handling for delivery*	*Cost of delivery*
1. Building stone (sedimentary)[a]	A	C	B	BC	C	C	C	C	C	C	AB	A	C	AB	BC	A
2. Building stone (igneous & metamorphic)[b]	C	B	B	B	B	C	C	C	C	C	B	B	C	B	BC	B
3. Natural aggregates	A	A	B	BC	C	B	C	C	B	C	C	BC	C	A	BC	A
4. Synthetic aggregates	A	A	A	B	B	B	A	AB	A	A	C	B	C	A	BC	A
5. Portland cements[c]	A	AB	A	C	AB	B	B	A	A	A	B	AB	AB	A	C	A
6. Limes[c]	A	C	A	C	C	C	C	AB	B	C	C	A	B	A	C	B
7. Gypsum plasters[c]	B	B	B	C	AB	C	C	C	B	B	AB	B	B	A	C	A
8. Plasterboard	B	A	B	C	A	B	C	C	B	B	AB	B	C	B	C	B
9. Glass sheet	B	A	A	C	A	A	BC	A	B	B	B	A	B	B	BC	B
10. Concrete blocks	B	AB	C	C	BC	AB	C	C	B	B	C	AB	C	A	BC	A
11. Concrete tiles	B	B	C	C	B	B	B	C	C	B	C	B	C	A	C	A
12. Concrete pipes[d]	B	A	C	B	BC	A	B	B	A	B	C	C	C	B	AB	A
13. Sand-lime bricks	AB	C	B	C	C	BC	C	BC	C	C	C	A	C	A	C	A
14. Asbestos-cement products	C	A	C	B	B	B	C	A	A	B	BC	AB	C	B	C	B
15. Pre-cast concrete units	B	B	B	C	BC	A	B	B	AB	AB	BC	AB	C	A	AB	A
16. Pre-stressed concrete units[e]	B	B	C	B	B	B	A	A	B	B	B	BC	C	A	A	A
17. Woodwool slabs[f]	C	A	C	BC	BC	C	C	C	C	B	C	B	C	B	C	B
18. Clay bricks/blocks[g]	A	A	AB	C	BC	C	C	A	C	B	C	A	BC	A	BC	A
19. Clay tiles	C	B	B	C	B	C	C	C	C	B	B	A	B	BC	BC	B
20. Ceramic and stoneware pipes	B	B	B	C	B	C	C	C	C	C	B	A	B	B	BC	B
21. Ceramic sanitary ware	C	C	B	C	C	A	C	B	B	B	B	A	B	C	C	C
22. Sawnwood	BC	C	C	C	C	C	C	C	C	B	BC	AB	C	BC	C	B
23. Plywood panels	C	C	C	B	B	B	C	C	C	B	AB	AB	C	B	B	C
24. Chipboard units	B	C	A	C	B	C	B	AB	C	B	C	B	C	B	B	B
25. Timber window frames	C	C	C	A	C	A	C	C	C	B	B	BC	C	C	C	C
26. Timber flush doors	C	C	C	B	B	B	B	C	B	B	B	B	C	C	C	C
27. Plastics panels[h]	C	C	B	B	B	A	B	C	C	A	A	A	C	C	C	C
28. Plastics fabrication[i]	C	B	B	B	B	C	A	B	B	A	B	B	C	C	C	C
29. Roofing felts	C	C	C	C	C	C	C	A	B	B	B	*	C	B	C	C
30. Paints and varnishes	C	C	B	B	C	B	B	C	C	A	B	B	A	A	C	C
31. Joint sealants and mastics	C	C	C	B	B	B	B	C	C	A	C	B	A	A	C	C
32. Reinforcing bars[j]	B	C	C	A	C	A	B	B	A	B	B	C	C	C	BC	C
33. Rolled steel sections[k]	AB	A	A	C	A	A	B	A	B	B	A	B	C	B	A	B
34. Structural steel fabrication	C	B	C	A	C	A	B	C	C	B	B	A	C	C	A	B
35. Steel pipes	B	*	B	C	A	B	B	C	B	B	B	*	C	B	AB	B
36. Cast-iron pipes	B	A	B	C	A	B	C	B	B	*	B	B	C	B	AB	B
37. Steel window frames	B	C	C	B	B	B	B	B	C	B	B	*	C	B	C	C
38. Stainless steel sheet[l]	C	A	B	C	A	C	B	A	B	B	B	C	C	C	B	C
39. Aluminium sheet/extrusions[m]	C	C	C	C	C	C	B	B	C	A	A	*	C	C	BC	C
40. Aluminium window frames	C	B	C	A	B	B	A	C	C	B	B	C	C	C	C	B
41. Copper/brass pipes	C	*	B	C	A	B	B	A	B	B	B	*	C	C	AB	B

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[a] Including quarrying and processing.

[b] Excluding quarrying.

[c] Excluding extraction of raw materials.

[d] Including production of ancillary items such as man-holes, inspection chambers etc.

[e] Production in highly mechanized plants.

[f] Production on an industrialized scale.

[g] Production by modern plant.

[h] Production of purpose-made products.

[i] Including a variety of processes, of which the most important are injection moulding and extrusion.

[j] Excluding rolling bars, but including cutting, bending etc.

[k] Including smelting iron and steel and the rolling processes.

[l] Including production of sheet from steel slab.

[m] Production from ingot

APPLICATION OF THE METHODOLOGICAL FRAMEWORK

The use of the above methodological framework for the estimation of unit production cost is illustrated, in this section, by a real production situation in Kenya. Individual cost items are expressed in Kenya shillings (1983).

Step 1: Annual production of blocks is 66,000 (i.e. 240 per day).

Step 2: Annual materials requirements

Soil

6.5 kg of soil of suitable clay/silt content is needed per block; thus, 430 tonnes of soil will be used annually. Alternatively, if soil had a high shrinkage, it could be partly replaced by sand. Bearing in mind the different densities of soil and sand, 214 tonnes of soil and 196 tonnes of sand would be required, if they were in equal volumes.

Stabiliser

Ordinary Portland cement is used as stabiliser in the proportion of 4 per cent by weight. Thus, 17 tonnes of OPC are needed annually. Since the soil used had 15 per cent clay/silt content, it was very suitable for block making. Otherwise, a greater percentage of cement would have been required.

Water

One litre of uncontaminated water is needed per block. Thus, the annual consumption of water is 66,000 litres.

Oil

One litre of waste engine oil is needed per 250 blocks. Thus, the annual oil consumption is 260 litres.

Step 3 : Required equipment

For soil selection:

- 1 auger;
- 1 set of sieves;
- 4 linear shrinkage moulds;
- bottles.

For winning the soil:

- 2 wheelbarrows;
- 2 picks;
- 4 shovels.

For soil preparation:

- 1 sieving screen (if soil is adequately crushed);
- 1 pendulum crusher, instead of the sieving screen, if the soil needs crushing.

For block production:

- 1 hand-operated blockmaking machine with spares.

Work area:

- for drying soil, sieving, storage, cure: 50 m^2.

Step 4: Labour requirements for blockmaking

Supervision:	1 foreman/technician
Winning soil:	1 unskilled worker
Preparing and mixing:	2 unskilled workers
Block forming:	2 unskilled workers
Curing, stacking:	1 unskilled worker

The above team works 8.5 hours per day, 5.5 days per week and 50 weeks per year (i.e. 275 working days per year). The supervisor may, however, be involved in some other projects; he is assumed to work 250 days per year on this project.

Step 5 : Land and access requirements

The land area for quarrying the soil is estimated on the following basis:

- project life : 15 years;
- digging depth : 1m;

Thus, 3,000 m^2 of land are required (0.3 ha).

(If the block making production site moves frequently, the land requirement for quarrying will be negligible).

Land for access and production, including curing and storage areas: 200 m^2.

Step 6: Working capital requirements

Raw materials for one month: one twelfth annual estimate;
Salaries for one month: one twelfth annual estimate.

Step 7: Annual cost of materials

Item	Quantity	Cost (Kenyan shillings, Ksh)
Clay	430 tonnes at 43 Ksh/tonne[4]	18,490
Stabiliser, OPC	17 tonnes at 60 Ksh/50 kg bag	20,400
Water	66 m^3 at 0.4 Ksh/m^3	26
Oil	free	
Total annual cost of material		38,916

Step 8: Depreciation costs

- Initial cost of equipment	(Ksh)
(assumed life: 3 years)	
one Brepak machine	15,000
one sieving screen [5]	150
ancillary equipment	5,000
Total initial equipment cost	20,150

- Building costs (assumed life : 7 years)

temporary covered area (post and roof)
50 m^2 at 30 Ksh/m^2 1,500

- Annual depreciation costs

- For equipment : F1 (3 years, interest rate 14 per cent) = 2.322

$$\text{Annual depreciation cost} = \frac{20{,}150 \text{ Ksh}}{2.322} = 8{,}678 \text{ Ksh/year}$$

- For buildings: F2 (7 years, interest rate 14 per cent) = 4.288

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[4] If sand is used in place of some of the soil, it will cost twice as much per tonne.

[5] If a pendulum crusher had been required, it would have cost 14,000 Ksh.

$$\text{Annual depreciation cost} = \frac{\underline{1,500}}{4.288} = 350 \text{ Ksh/year}$$

Total annual depreciation cost is then equal to :

8,678 Ksh + 350 Ksh = 9,028 Ksh

Step 9 : Annual labour costs

- For skilled labour : 55 Ksh/day for 250 days per year = 13,750 Ksh

- For unskilled labour :

22.50 Ksh/day, 275 days per year, 6 workers = 37,125 Ksh.

Total annual labour costs : 50,875 Ksh

Step 10: Land rental cost

Small-scale units producing stabilised soil blocks are likely to be situated in areas commending low land value or rental, such as agricultural land. Rental value of the latter may thus be used for preliminary estimation of production costs. Taking into consideration a land requirement of 0.32 ha (see step 5), and an annual rental rate of 1,000 Ksh/ha, the annual rental rate may be estimated at:

0.32 ha x 1,000 Ksh/ha = 320 Ksh

Step 11: Interest on working capital

From step 7, the monthly cost of materials is:

38,916 Ksh / 12 = 3,243 Ksh

From step 9, the monthly cost of labour is:

50,875 Ksh / 12 = 4,240 Ksh

Total working capital requirement:

3,243 Ksh + 4,240 Ksh = 7,483 Ksh

Using an interest rate of 14 per cent, annual interest payments on working capital amount to:

7,483 Ksh x 0.14 = 1,048 Ksh

Step 12: Unit production cost

The total annual production cost is equal to the sum of the following cost elements:

	(Ksh)
Materials	38,916
Depreciation	9,028
Labour	50,875
Land rental	320
Interest on working capital	1,048
Total	100,187

For an annual production of 66,000 blocks, the unit production cost is equal to:

100,187 Ksh / 66,000 = 1.52 Ksh

Governmental measures aimed at the reduction of the entrepreneur's risk involved in small-scale production of local building materials

Type of solution	Measures to ensure solution
1. Institutional support	a) Strengthening the capacity of selected existing institutions to enable them to carry out policies and strategies for the sector;
	b) Promoting the development of association or co-operatives among small-scale producers;
	c) Providing logistic support to associations or groups of small-scale producers - notably, organizational guidelines, auditing assistance and access the vehicle and plant pools.
2. Acquiring appropriate technologies	a) Establishing local technology-information centres to receive and collate data on selected technologies and disseminate such information to the target group.
	b) Providing incentives, such as awards to encourage the development of local innovations;
	c) Facilitating the procurement of selected machinery or making basic machinery available to groups of producers;
	d) Strengthening the resource capacities of local research institutions or similar agencies to enable them to demonstrate successful innovations;
	e) Providing training to producers through extension services.

3.	Access to raw materials	a)	Compiling and providing information on small deposits of raw materials;
		b)	Providing support for communal efforts in constructing access roads to the sources of raw materials;
		c)	Assisting associations or groups of small scale producers with vehicles to collect and distribute raw materials;
		d)	Undertaking tests on suitability of raw materials and making findings known to investors.
4.	Credit facilities	a)	Promoting non-conventional credit systems for the small-scale system;
		b)	Providing training in basic financial management to small-scale producers;
		c)	Promoting the mobilization of savings among small-scale producers and strengthening or establishing appropriate savings banks;
		d)	Facilitating foreign-exchange allocations for purchase of selected inputs for small-scale production of building materials.
5.	Formulation of standards and quality control procedures and revision of building codes	a)	Designating a lead agency at the national level to co-ordinate formulation of standards, promotion of quality-control procedures and revision of building codes and to provide continuous review of provisions to allow for innovation and change;
		b)	Promoting construction programmes which *inter alia*, will serve to demonstrate the application of reformulated building codes and regulations;
		c)	Encouraging the decentralization of administration of regulatory procedures

6. Non-conventional system of production for low-income shelter	a) Specifying building materials which are suitable for self-help production or community participation methods in low-cost housing schemes; b) Promoting innovative low-income housing policies and programmes which are support of non-conventional production of materials. c) Using non-conventional building materials production systems in government-assisted low-income housing projects; d) Providing basic inputs, such as machinery to production teams and assisting with on-the-job training.

Measures at international level designated for the reduction of the entrepreneurs' risk involved in small-scale production of local building materials

Type of solution	Measures to ensure solution
1. Information flow	a) Assisting in the preparation and publication of field manuals, data sheets, and information kits on selected areas for improvement, such as quality-control procedures and standards formulation; b) Assisting in setting up information centres, which, among other things, could be responsible for providing data on technologies, sources of raw materials and research findings; c) Providing basic audio-visual equipment to be used for disseminating information; d) Supporting the establishment of a network of information exchange on technology adaptation, research findings and applications, and other issues related to the development of small-scale building materials systems.
2. Manpower training	a) Providing resource support in running national or regional seminars and workshops on selected subjects, such as formulation of standards, procedures for upgrading existing technologies and methods for credit assistance; b) Providing fellowships for on-the job training c) Preparing training manuals on selected topic to be used in field application; d) Assisting in setting up or strengthening institutions for basic skill training.

3.	Joint research and development projects	a)	Undertaking testing of innovative materials and assisting in formulating standards for such products;
		b)	Providing inputs, such as machinery and equipment, for joint demonstration projects;
		c)	Assisting in exchange of research personnel for selected joint research projects;

Project Proposal No. 33
Making Wood Wool Boards in India

Predesign cost estimates

Name of the Project	Manufacture of Wood Wool Boards
Products	Wood Wool Boards
Capacity 75000 boards of size 2 mx0.5 mx25 mm per annum.	(a) per day (of three shifts) (b) per year (300 working days)

			Rs.	Rs.
I.	CAPITAL INVESTMENT			
A.	Fixed Capital on Building			
(a)	Land 800 sq m @ Rs.25.00/sq m		20,000.00	
(b)	Yard improvements etc. L.S.		1,000.00	
(c)	Building 16 sq m @ Rs. 350.00 sq m		5,600.00	
(d)	Building Shed 500 sq m @ Rs. 225.00/sq m		112,500.00	
	Fixed Capital on Buildings;		139,100.00	139,100.00
B.	Fixed Capital on Plant			
1.	Purchased Equipment, delivered (PE) (Delivery charges 2-4% of equipment cost)	Hydraulic Press 2 Nos.	6,000.00	
		Weighing Machine 2 Nos.	4.000.00	
		Wooden Moulds 250 Nos.	50,000.00	
			60,000.00	60,000.00
2.	Equipment erection Simple Plant 10% of PE			6,000.00
3.	Electrical installation 10% of PE			6,000.00
4.	Water services & Drainage about 10% of PE			6,000.00
5.	Laboratory, workshop about 10% of PE			6,000.00
6.	Engineering & vision 10% of PE			6,000.00
7.	Premium etc.			2,000.00
8.	Contingency 10% of			

fixed capital on plant		10,000.00
Fixed Capital on Plant		102,000.00
Total Fixed Capital (A + B)		241,100.00

C. Working Capital

(20% on Annual Sales)	150,000.00	
Total Capital Investment		150,000.00
(A + B + C)		391,100.00

II. COST OF PRODUCTION

(Basis 300 working days per annum)

	Cost per unit production Rs.	Annual Cost Rs.	Rs.
1. Raw Materials			
(a) Cement	3.00	225,000.00	
(b) Wood wool	2.50	187,500.00	
(c) Chemicals	0.50	37,500.00	
		450,000.00	450,000.00

2. Utilities	Unit	Rate	Qty.	Amount	
(a) Electric power	KWH	Rs. 0.20	10000	2000.00	
(b) Untreated Water	K.L	Rs. 1.00	500	500.00	2,500.00

3. Labour & Supervision

1 Manager @ Rs. 600.00 per month	7200.00	
3 Operators @ Rs. 300.00 per month	10800.00	
24 Labourers @ Rs 150.00 per month	43200.00	
	61200.00	61,200.00

4. Maintenance & repairs

(a) Plant @ 6% of B for normal plants	6120.00
(b) Building @ 2% of Building & Shed in A	2362.00

	8482.00	8,482.00
5. Operating Suppliers: 15% of maintenance & repairs.		1,272.00
6. Taxes and insurance 2% on total fixed capital (A+B)		4,822.00
7. Plant overhead (includes cost of general plant overhead, Payroll overhead, packaging, medical services, safety & protection laboratories, storage facilities etc). 50% of L & E and maintenance and repairs.		34,481.00
8. Depreciation		
(a) Plant : 10% of B for normal service	10200.00	
(b) Building: 2.5% of Building & Shed in A	2952.00	
	13,152.00	13,152.00
9. Administrative Expenses @ 2% of sales		15,000.00
10. Distribution and Selling costs: @ 5% of sales		37,500.00
11. Interest on Total capital investment @ 9% per annum		46,932.00
Total Cost of Production		675,701.00

III. PROFITABILITY

1. Gross Annual Income (sales) 75000 boards @ Rs. 10.00 each	750,000.00
2. Annual Cost of Production	675,701.00
3. Annual Return (Item 1-Item 2)	74,299.00
4. Return on Investment	

$$\frac{(\text{Annual return x } 100)}{\text{Total Capital Investment}} = \frac{74299 \text{ x}100}{391{,}100} = 19\%$$

TIME	WORK PLAN FOR POZZOLIME PROJECT																										
	1988			1989												1990											
ACTIVITY	OC	NO	DE	JA	FE	MA	AP	MA	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MA	APR	MA	JU	JU	AUG	SE	OC	NO	DE
1. Preliminary Surveys	X	X																									
2. Clearing of Sites			X	X																							
3. Order of tools and equipment				X	X	X	X	X	X																		
4. Installation of plant										X																	
5. Excavation for pozzolana											X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
6. Production of lime											X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
7. Production of pozzolime												X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
8. Preparation of teaching programme					X	X	X	X	X	X	X	X															
9. Training of Technicians										X	X	X	X														
10. Training of Entrepreneurs								X	X	X	X	X	X	X	X												
11. Design of dem projects													X	X	X												
12. Marketing Campaign											X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
13. Building of dem houses																X	X	X	X	X	X	X	X	X	X	X	X

Cash Flow Analysis ¢ 1,000

Cash Inflow	Yr. 1 ¢	Yr.2 ¢	Yr.3 ¢	Yr.4 ¢	Yr.5 ¢	Yr.6 ¢	Yr.7 ¢	Yr.8 ¢	Yr.9 ¢	Yr.10 ¢
Cash at Beginning of year	-	22.20	106.65	268.21	441.83	627.49	826.81	1039.78	1266.40	1506.68
Net Profit After Tax	20.26	112.14	227.81	245.90	263.95	284.44	304.92	325.40	345.88	366.37
Depreciation	515.45	515.45	515.45	515.45	515.45	515.45	515.45	515.45	515.45	515.45
Total Cash Inflow	535.76	649.79	849.91	1029.56	1221.23	1427.38	1647.18	1880.63	2127.73	2388.50
Cash Outflow										
Loan Repayment	505.76	505.76	505.76	505.76	505.76	505.76	505.76	505.76	505.76	505.76
Dividend	6.75	37.38	75.94	81.97	87.98	94.81	101.64	108.47	115.29	122.12
Total Cash outflow	513.51	543.14	581.70	587.73	593.74	600.57	607.40	614.23	621.05	627.88
Cash at end of year	22.20	106.65	268.21	441.83	627.49	826.81	1039.78	1266.40	1506.68	1760.62
Debt Service Coverage	1.04	1.20	1.46	1.75	2.06	2.38	2.71	3.06	3.43	3.80

Average Debt Service Coverage 2.29

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